The UNESCO Courier
A window open on the world
February 1974 (27th year) - 2.40 French francs

THE ICELAND SAGA

TREASURES
OF
WORLD ART

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CHINA

Maiden from Maichisan

Cut into the sheer cliff face, the 187 cave temples of Maichisan, in Kansu province, are among the spectacular archaeological discoveries made in China in the last 20 years. They contain some of the earliest examples of Chinese Buddhist sculpture. The most common theme is the seated Buddha flanked by bodhisattvas and other figures such as this young girl attendant dating from the Northern Wei dynasty (386-535 A.D.).

Photo © Expedition 1958, de Silva-Darbois. Taken from " The Caves Temples of Maichaisan ",

MC/012

The UNESCO Courier

FEBRUARY 1974
27TH YEAR

PUBLISHED IN 15 LANGUAGES

English Arabic Hebrew
French Japanese Persian
Spanish Italian Dutch
Russian Hindi Portuguese
German Tamil Turkish

Published monthly by UNESCO
The United Nations Educational, Scientific and Cultural Organization
Sales and Distribution Offices
Unesco, Place de Fontenoy, 75700 Paris
Annual subscription rate 24 French francs

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The UNESCO COURIER is published monthly, except in August and September when it is bi-monthly (11 issues a year). For list of distributors see inside back cover.
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The Unesco Courier is produced in microform (microfilm and/or microfiche) by : (1) University Microfilms (Xerox), Ann Arbor, Michigan 48100, U.S.A.; (2) N.C.R. Microcard Edition, Indian Head, Inc., III West 40th Street, New York, U.S.A.; (3) Bell and Howell C°., Old Mansfield Road, Wooster, Ohio 44691, U.S.A.

The Unesco Courier is indexed monthly in the Readers' Guide to Periodical Literature, published by H. W. Wilson Co., New York, and in Current Contents - Education, Philadelphia, U.S.A.

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28 JAN. 1974

N° 2 - 1974 MC 74-2-29E

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Maiden from Maichisan (China)

Photo © Icelandic Embassy, Paris

THE ICELAND SAGA

The hardy ponies of Iceland seem to have stepped straight out of a Lascaux cave-painting. Brought over from Norway by the Vikings, the ancestors of these ponies carried the early settlers to every corner of the new land and for centuries were the Icelanders sole means of transport. Today, in a world of cars and planes, they are beloved by all Icelanders.

UNESCO ARCHIVES

LIVING ON A VOLCANO

Despite its name, Iceland is one of the 25 natural 'hot-spots' of the world

by
Sigurdur Thórarinsson

A June day in the year 1000. At Thingvellir on the Oxará River, in Iceland, the Althing has been in session for some days. For threescore and ten years this assembly, which in modern times has sometimes been referred to as "the Grandmother of Parliaments", has been convening for two nightless weeks in June every summer. At its session this summer the Althing has to decide a question more fateful than any it has ever been faced with: whether in the future paganism or Christianity shall reign in the land.

Thingvellir is an extraordinary setting for a parliament: the level, grassy banks of the Oxará River, and above the west bank a lava slope which rises to form the east wall of a great lava

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Photo © Icelandic Embassy, Paris

The towering pillars of an Icelandic basalt rock formation, thrown up by millenial volcanic upheavals and forming a natural "Parthenon" of the Hyperboreas, or "Land Beyond the North" of Greek legend.

Eleven centuries ago, the westward wave of Scandinavian migration reached a new land, just south of the Arctic Circle, where ice contended with fire, where glaciers, volcanoes and boiling springs seemed to hurl defiance at man and at each other. This was Iceland. In this issue of the "Unesco Courier" we recount the saga of the Icelandic people's unending struggle with a hostile climate, the splendours of the literary heritage of a unique culture, and the beauty and geological contrasts of a country still shrouded in legend but in which myth has blended into the modernity of the 20th century.

chasm. The dark west wall of the chasm echoes every word spoken on the brink at the top of the lava slope, the site of Lögberg, the Law Rock.

From this rock the Law Speaker, the supreme officer of the Althing, must annually recite before the assembly and the general public the unwritten laws of the nation, one third of the code for each of his three years in office, in order that the law may be known and that the legislature may alter and amend it as needed.

The conflict between pagans and Christians appears beyond peaceful settlement and the young republic is on the brink of religious civil war. "But at that moment", says one of the ancient sources, "a man came running with the message that an earthfire had broken out in Ölfus and was likely to overrun the farm of Thóroddur, the Chieftain-Priest."

Those of the heathen party said: "It is no wonder that the gods are angered by such words as have been spoken here." Then Snorri the Chieftain-Priest asked: "What angered the gods when this rock burned on which we are now standing?" The heathen leaders were at a loss for words. Everyone present knew quite well that he was standing on ancient lava that had flowed long before the country was settled. The Althing of 1000 A.D. ended by resolving that henceforth all Icelanders would be Christians.

July 20, 1783. The scene is Kirkjubaejarklaustur, an ancient estate in the heart of the district of Sída in southern Iceland. In the parish church, a decaying, low-roofed structure of stone and turf, a service is in progress. This service is to go down in Icelandic history as "the Fire-Mass", but the subject of the preacher's sermon this Sunday is not the Fire of Hell: he speaks of the fire in the earth which for forty days and forty nights had been harrying the region.

On June 8, a twelve kilometre long fissure had opened up in the highland pastures south-west of Vatnajökull Glacier. The lava flowed down along the gorge of the Skaftá River and spread out over the farming districts of Sída and Medalland. It has been calculated that during those first forty days the average flow from the fissure was twice that of the Rhine at its mouth.

When the eruption finally came to an end almost six months later, the lava flow covered 565 square kilometres, and by the end of the following year, seventy-five per cent of the country's livestock had perished, either directly from the poisonous effects of fluorine and other pollutants or because of the failure of the grass crop caused by the blue haze, and some 10,000 people, or rather more than a fifth of the nation, had died of hunger or disease caused by the eruption.

May 2, 1970. In the valley of Thjórsárdalur in southern Iceland a sizeable group of people have gathered for a festive occasion: a 220,000 kW. hydro-

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Winter and summer alike the people of Reykjavik, the world's northernmost capital, enjoy a swim in the open-air bathing pools (opposite) heated by water from the natural hot springs in and near the city. Most of the city's houses and public buildings are also heated by hot spring water (see article page 24). Right, farmer from the Lake Myvatn district of northern Iceland. Below, the springtime of youth.

Photo © Icelandic Photo and Press Service, Reykjavik, Iceland

Photo © Gamma, Paris

LIVING ON A VOLCANO *(Continued)*

electric power plant, the largest by far in the country and one of the greatest engineering projects ever undertaken in Iceland, is about to be inaugurated.

During the first centuries after the colonization of Iceland, this then hospitable valley sheltered a flourishing farming community. But in 1104 Hekla erupted for the first time in the nation's history, making the larger part of Thjórsárdalur so utterly waste that no resettlement was ever attempted.

Through all these centuries the upper part of the valley remained a white desert, covered with light-coloured rhyolitic pumice. But with the harnessing of the Thjórsá River, efforts were made to cover the desert with grass in order to prevent the drifting of dust and sand around the powerhouse.

The guests at the dedication ceremony see grassy ground on every hand, and the President and other speakers talk of the white desert having at last taken on again the green colour of life. Three days later, a rain of coarse cinders and ash beats down on the roof of the powerhouse. Hekla has started again. And when the ash fall lets up after two hours, the valley once more is a desert. A black desert, this time.

These are three incidents in the history of country which in spite of its

Photo © Gamma, Paris

coldest-sounding name is nevertheless one of the hottest. For Iceland is one of the twenty-five or so regions in the world now referred to by geologists as "hot-spots". Virtually all of Iceland has been built up in volcanic eruptions, and about one third of the country is an active volcanic region.

The principal zone of activity lies in a broad belt across the country from north to south, the southern half forming two distinct branches. This volcanic region forms part of the system of rifts and ridges that runs the length of the Atlantic ocean.

In the volcanic regions of Iceland nearly every type of volcano found on the globe is represented, but the commonest type is the crater row.

It is characteristic of Iceland that some of the most active and most vigorous of the country's volcanoes are covered by eternal ice, so that the eruptions are accompanied by gigantic water floods, the so-called *jökulhlaup*, or glacier bursts, the heat from the eruption melting the ice from below until the water forces its way out from under the ice cover.

It is thought that volcanic activity has occurred in about thirty different locations in Iceland since the country was settled and that on the average one eruption takes place every fifth year.

The main feature of volcanic activity in Iceland is that many volcanoes erupt only once and that in the volcanic zones a new volcano may come into being almost anywhere and at almost any time. Usually this happens far from human habitations, but fissures have been known to open up to spew their fire practically on people's doorsteps.

The most recent eruption in a settled area occurred in the early hours of January 23, 1973, when a one and a half kilometre long rift opened up on Heimaey, the principal island in the Vestmannaeyjar (Westmann) group, about 100 metres from the houses on the southern edge of the most important fishing town in the country (see photos pages 16 to 19).

This eruption lasted for five months. Where once stood dwelling houses, there now rises a new mountain, Eldfell, about 220 metres high, and a third of this once bustling town, where one fifth of the nation's total catch of fish used to be brought ashore, has disappeared under a thick cover of cinders and lava.

And how does the Icelandic nation like living with all this volcanic activity? How does it feel about its volcanoes?

Innumerable place-names testify to the wonder and interest with which the settlers regarded vulcanism and the phenomena associated with it, such as thermal springs and earthquakes; after all, they had had no experience of such things in their former homes.

It is more than likely that the description of Ragnarök, the final destruction of the world, in the Eddic poem "The Sybil's Prophecy" was partly inspired by a great ash eruption.

The Icelanders soon learned to view such natural phenomena in a rational and realistic light. There are few signs of any superstitious beliefs centering on volcanoes in Iceland. The idea that Hell was situated under Mount Hekla in Iceland never caught on with the Icelanders.

In accounts of earthquakes and other natural catastrophes in former ages, the only feature that smacks of the legendary is that invariably one individual somehow survives: the soul of the nation refuses to acknowledge total defeat by the forces of nature.

To be sure, the Icelanders have a healthy respect of their volcanoes, and they have now taken steps to reduce the damage caused by eruptions,

CONTINUED NEXT PAGE

ICELAND—GEOLOGICAL HOT-SPOT. **A purely oceanic island with no foundation of continental rock, Iceland has been almost entirely built up by volcanic action and remains one of the geological "hot-spots" of the world, with an average of one eruption every five years. The map below (part of a larger map of the Atlantic ocean floor, reproduced here by special permission of the National Geographic Society, Washington D.C., U.S.A.) shows Iceland rising from the crest of the Mid-Atlantic Ridge, the immense submarine mountain range, itself only part of the Mid-Oceanic Ridge which encircles the entire globe. Key to figures shown on map: -4500, depth in feet below sea level; (11500), height in feet above the 16,000-foot average depth of the abyssal plain.**

Copyright © 1968 by the National Geographic Society, Washington, D.C.

LIVING ON A VOLCANO *(Continued)*

including a warning system in the volcanic zone, which proved its value during the Eldfell eruption. But they have also, ever since Romantic writers first opened men's eyes to the beauties of nature, regarded their volcanoes with an admiration that in somes cases verges on veneration.

What Popocatepetl and Iztaccihuatl are to the people of Mexico City or Fuji to the Japanese, Snaefellsjökull is to the inhabitants of Reykjavik. While the great eruption of Hekla in 1947 was going on, the principal worry of some of the people in the neighbourhood seemed to be that the shape of the mountain might somehow be spoiled as a result of the eruption.

But the Icelanders have also learned to make use on an ever increasing scale of the wealth of natural heat that is one consequence of their country being a young volcanic one. (See article page 24.) Ever since settlement times 1,000 years ago, they have used the hot springs for washing and bathing. A famous incident connected with the conversion to Christianity in the year 1000 involved the refusal of the Northerners present at the Althing to be immersed in the cold water of Thingvellir; they had to be taken to a hot spring fifteen miles away before they would consent to being baptized.

In areas with hot springs it was formerly the custom to bake bread by burying the dough in the boiling hot mud or sand. But it was not until the fourth decade of the present century that the natural heat began to be harnessed on any considerable scale.

At first it was mainly used for heating houses, and by now more than half the nation, including virtually the entire population of the capital, lives in houses heated by natural hot water. Greenhouses heated in the same fashion supply the population with flowers and vegetables, and even grapes and such tropical fruits as bananas may be found there, although to tell the truth, their cultivation is of rather greater significance for the tourist brochures than for the national economy. The great majority of people can go for a healthful swim the year around in outdoor pools heated with water from hot springs.

In addition, the natural heat represents an enormous untapped source of energy which in the future may be expected to provide a basis for further industrial development.

It is safe to claim that in spite of severe blows from eruptions and earthquakes every now and then, the volcanic character of Iceland makes it a better country to live in than it would otherwise be.

During the recent eruption in Vestmannaeyjar, it became evident once more that living with the forces of Icelandic nature has ingrained into the nation an attitude of stoic composure, grounded in the knowledge that such things are no more than what one must always expect on the fiery Atlantic island where this small nation has, after all, held out for eleven hundred years. ■

THE ICELAND SAGA

1

The Vikings settle a new land

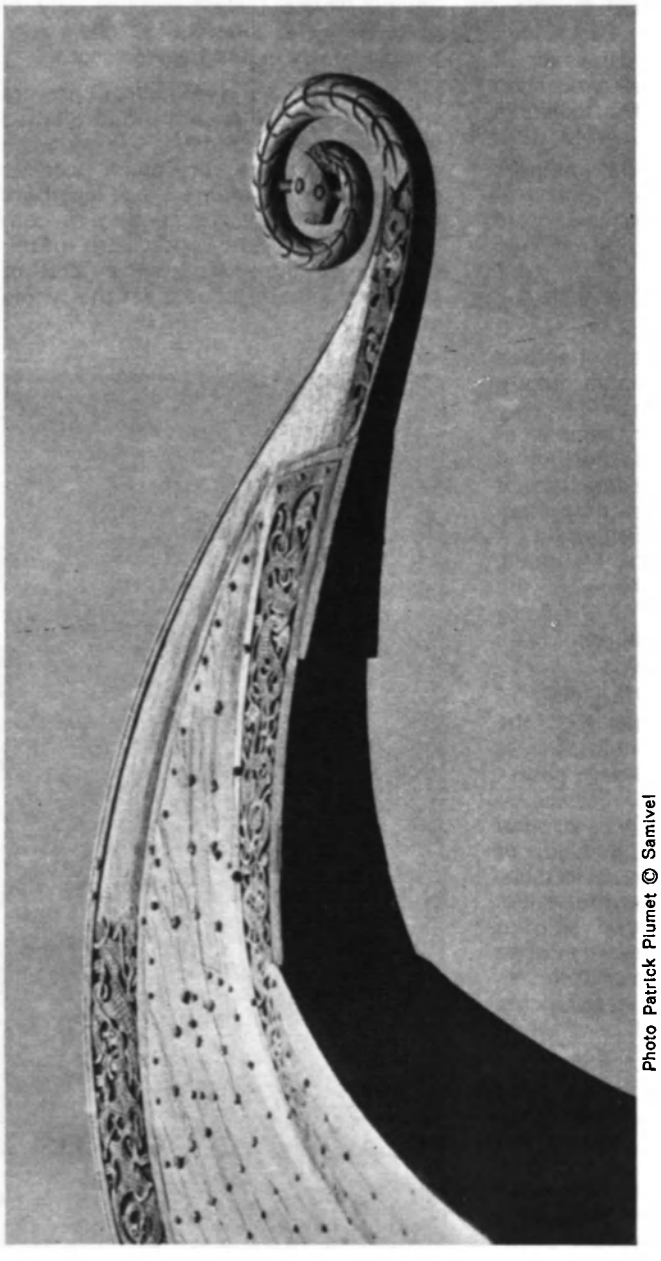

Photo Patrick Plumet © Samivel

The finely carved prow of a Viking long-ship. Strong, easily-handled craft built of oak, these drakkar, or dragon boats as they were often called, generally measured from 14 to 27 metres in length and were propelled by sail and oar. It was in such ships that the Vikings sailed the seas of Europe and the Mediterranean and crossed the Atlantic to Iceland, Greenland and North America. It was the custom to bury a Viking chieftain in his drakkar, and at the end of the 19th century a perfectly preserved, early 10th century drakkar was unearthed from a burial mound in Norway.

by Jónas Kristjánsson

THE discovery and settlement of Iceland formed part of the great expansion of the Nordic peoples during the age that takes its name from the Scandinavian Vikings. In their swift and sturdy ships the Vikings sailed across the sea, sweeping like wildfire over islands and coasts, and founding independent Viking states in Scotland, Ireland and England in the west, in France in the south, in Russia in the east.

Though some of their states, such as Normandy in France and Holmgard, the old Norse name for the city-state of Novgorod in Russia, became powerful, the small ruling element was gradually absorbed by the native mass, losing both language and national identity. The only places where this did not happen were previously uninhabited lands occupied by the Vikings. Iceland was the only permanent state founded by the Vikings during this period.

Ari Thorgilsson the Learned (1067-1148) the first Icelandic author, who wrote a brief history of Iceland—*Islendingabók* (The Book of the Icelanders)— says that the first settler made his home there "a few years" after 870 while another ancient source tells us that this happened in 874.

Thousands of settlers crossed the stormy seas in open vessels; men with their wives and children and other kinsfolk, housecarls (bodyguards of kings and nobles) and thralls (serfs). With them they took clothes and provisions, utensils and domestic equipment as well as animals.

During the Age of Settlement (9th to 10th century) the climate of Ice-

CONTINUED NEXT PAGE

JONAS KRISTJANSSON, *director of the Arni Magnusson Institute for the study and preservation of ancient Icelandic manuscripts in Reykjavik, is a noted authority on Iceland's language and literature. Professor at the University of Iceland, he has written many books and studies on Icelandic literature. One of the best known, "Icelandic Sagas and Manuscripts", richly illustrated in full colour (Saga Publishing Co., Reykjavik, 1970) has been translated into English, Danish and Norwegian.*

land must have been relatively mild. There was an abundance of fish in the rivers and lakes and coastal waters of the island. The lowlands were covered with rich pasture and birch-woods that reached high up the slopes of the mountains.

Some of the newcomers described the new country as a fishing-station, while one declared that every blade of grass dripped butter. However, it was soon found that there were two sides to the picture and the Icelandic weather could be unaccountable.

One of the earliest would-be settlers lost all his livestock in the rigours of the first winter, and went back to his homeland. Before leaving he climbed a high mountain and saw a fjord filled with drift-ice, whereupon he gave the country its chilly name.

From the start the people that settled the new land had a distinctive culture and customs of their own. This may be due to the particular sample of Norwegians that migrated there, and especially to the slight admixture of Celtic stock among the settlers from the Celtic parts of the British Isles, including the islands of the Hebrides, Orkneys and Shetlands. Many of the thralls who later mixed with the free-born immigrants were also of Celtic origin.

Towards the close of the Age of Settlement, about the year 930, the Icelanders combined to establish a common state and general assembly—the Althing—for their land. The country was divided into four Quarters, and each of these into nine *godord*, or chieftaincies, except the Northern Quarter, in which there were twelve. The chieftains in charge of the heathen sacrifical rites were called *godar*, and these were also the leaders of this miniature state. In early spring a district assembly would be held in the territory of every three chieftaincies.

Though the Icelandic laws were based on the Norwegian ones of the settlers' native districts, these were considerably supplemented and amended. They are preserved complete in two vellum books dating from about the time when the Icelandic national state came to an end in the latter part of the 13th century.

At the Althing, as might be supposed, the *godar* were supreme. They were self-appointed members of the legislature *(lögrétta)*, the court that amended old laws, drafted new ones and gave judgement on points of law. To ensure its efficient and impartial operation, however, every *godi* had two advisers, one sitting behind him and one before.

The judicial courts of the Althing were four in number, one for each Quarter. The *godar* nominated a man each in every Quarter Court, thus giving them effective control, though the interests of parties to a dispute were safeguarded by their right to object to any member of the court on grounds of unsuitability for his office.

Many features of the Icelandic Constitution were unique, beside being more democratic than in neighbouring lands. There was no king to oppress his subjects with tyrannical commands. The power was equally divided between thirty-nine farmer-chieftains, among whose tasks was the duty of protecting the interests of their own people, each in his own district.

The legislative and judicial powers were completely separate and allotted to independent bodies. In criminal cases juries were very much used as evidence of character, the members giving their verdict according to conscience. At a fairly early date a Fifth Court was introduced as a kind of supreme court of appeal for the whole country.

In the early centuries after the settlement the inhabitants possessed a large and effective fleet of ships, and the wanderlust that had driven their forefathers to Iceland was still in their blood. From here they voyaged further westwards in search of new lands. Eirik the Red, a man from the west of Iceland, discovered a large country which he named Greenland—"and said that it would urge men to go there, that the land had a good name", observes Ari the Learned.

During the next few years many emigrated from Iceland to Greenland, establishing there a settlement that flourished at the start. From Greenland it was not far to the North American continent, and the sea-dogs of Greenland soon had a glimpse of yet other lands to the southwest.

Photo © Icelandic Embassy, Paris

Leif the Lucky, son of Eirik the Red, set out to find these lands about the year 1000, discovering three, to which he gave the names *Helluland* ("flagstone-land"), *Markland* ("forest-land") and *Vinland* ("wine-land"). *Helluland* and *Markland* were probably Baffinland and the Labrador peninsula. *Vinland* could have been Newfoundland, on whose northernmost promontory very ancient Norse remains have recently been discovered. ■

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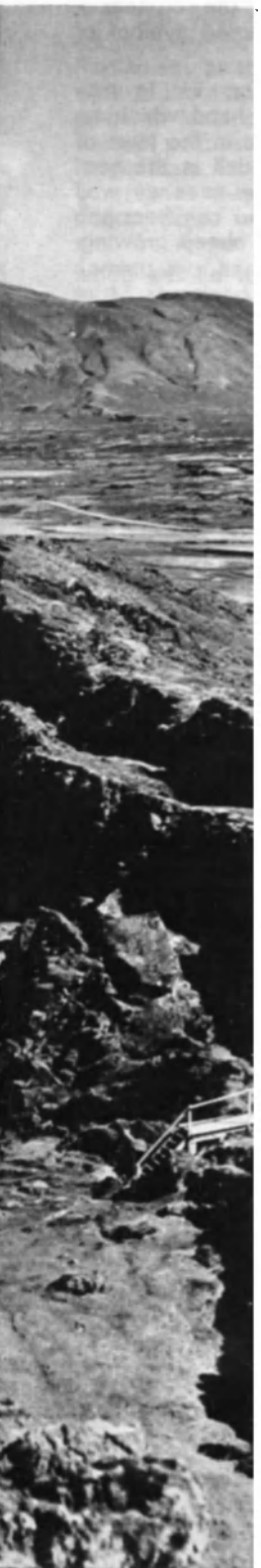

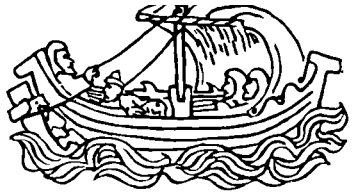

Drawing © Saga Publishing Co., Reykjavik

THE ICELAND SAGA

2

The birth of an original form of literature

THE history of Iceland's rich and varied literature dates back over 1,000 years. At the earliest period, the Icelanders had no written literature, but in poem and story they preserved memories of times long past, of notable events not only in their own country but also among their neighbours, their sister nations across the sea, especially Norway, Sweden and Denmark, from whence their forefathers had come.

In this they were not unique: settlers in a new land often seem to have a memory more retentive of ancient lore than that of those who remain behind. The stories of Norse gods and heroes are now a familiar part of the European heritage of myth and legend, but it is not always realized that knowledge of them derives chiefly from Icelandic manuscripts.

The settlement of Iceland itself about 870 A.D. was itself a tremendous event, bound to leave its imprint on the nation's memory and give birth to stories and tales. In the Settlement Age the Icelanders had no books, and between the founding of the Icelandic state in 930 and the beginning of the Age of Writing towards the end of the 11th century just the right length of time passed for the tales of ancient heroes to mature in oral tradition.

The history of Old Icelandic literature may be roughly divided into three periods. First there is the period of oral literature, lasting from settlement times until about 1100. At this time poems and occasional verses were composed on a great variety of subjects and memorized and handed down from generation to generation.

CONTINUED NEXT PAGE

This natural amphitheatre, at Thingvellir, was the cradle of Europe's oldest parliament, the Althing, whose first meeting in 930 A.D. marked the birth of the Icelandic state. Meetings were held each summer in the open air. Today the Althing meets a 19th-century building in Reykjavik. Old traditions persist and at an annual banquet it is customary for members of parliament to make their speeches in verse. Below, a cavalcade crosses the Thingvellir plain. Top of page, 16th century drawing of an Icelandic sailing-boat, a direct descendant of the Viking drakkar (see page 9).

Photo © Icelandic Photo and Press Service, Reykjavik

In the same way memories of men and events as far back as the Settlement Age or even earlier times were kept alive, and tales of ancient worthies were told for instruction or entertainment. This period may thus be called the *Age of Tradition.*

The first works written in the Icelandic language were produced towards the end of the 11th century. On the one hand we find translations from Latin of religious writings—saints' lives, homilies, etc.—and on the other, historical and other learned works—law books, genealogies, and concise histories, with Ari the Learned's *Book of the Icelanders* as the outstanding example. The 12th century can therefore rightly be termed the *Age of Learning.*

In the course of time Icelandic historical writing underwent a remarkable development which led to the creation of a rich and varied narrative literature. In other languages the Icelandic word *saga* has been adopted to describe this literature. The earliest preserved sagas date from the end of the 12th century, and the most recent were probably composed around 1400. The third and last period of Old Icelandic literature, from c. 1200 to c. 1400, can thus be called the *Age of Sagas.*

After this time no original prose literature to speak of was produced until the latter half of he 16th century, by which time the Reformation had paved the way for new kinds of literature in the Icelandic language.

When we speak of the first period *(Age of Tradition)*, it is customary to distinguish two kinds of Old Icelandic poetry: Eddic poems and Scaldic (or Court) poems. Both forms of poetry have their roots in Scandinavia or, in the case of the Eddic poems, even farther south. The oldest poems were composed in Norway, but the bulk are Icelandic, and they have been preserved only in Iceland.

The earliest Icelandic poetry is closely bound up with pagan beliefs. Many of the ancient poems deal directly with the old gods, while poetry itself is the gift of Odin and its language derived from pagan religion and the legends of the gods. One word has become a kind of common denominator for these religious beliefs and poetry—the name *Edda*, which means great-grandmother.

To explain the art of poetry or teach would-be poets how to compose could not be done without giving an account of the old beliefs and telling the stories of the gods on which the poetic vocabulary was based.

According to the old Norse beliefs, the gods live in Asgard as a large family, though each individual has his specific dwelling. Their chief is Odin, god of poetry, runes and magic. To Valholl, his abode, go all men who have died in battle.

Many of the principal gods are sons of Odin. Of these the most popular is Thor, who is also the biggest and strongest. He batters the giants with his hammer Mjolnir ("the crusher"), which becomes the sacred symbol of pagans.

Tyr is the god of war. He is one-handed, having lost a hand which he had placed as a pledge in the jaws of the wolf Fenrir. Heimdall is the sentinel of the gods. He sees as well by night as by day and can hear the grass and the wool of sheep growing.

Baldur is the best of all the gods. "He is so fair of countenance and so bright that he shines." But Loki, crafty and the scandalmonger of the gods, brings about the death of Baldur, who then descends to the abode of Hel to share a miserable existence with those who die of disease and old age.

Njord, the god of navigation, belongs to another race called Vanir. His children are Frey and Freyja, deities of love and fertility who enjoyed an extensive cult throughout Scandinavia.

The gods are at perpetual war with their enemies the giants who live in the rocks and caves of Jotunheim. With them are associated various monsters such as the wolf Fenrir, whom the gods bound, and Midgardsorm, the World Serpent, that lies encircling the earth with its tail in its mouth.

But the Icelanders also composed

poetry of another kind, the so-called Scaldic of Court Poetry that is different from Eddic poetry in form and content. This kind of poetry originated in Scandinavia and reached its maturity in Iceland. Scaldic poetry is characterized by a highly elaborate and artificial form, requiring the use of a special poetic diction and complicated syntax and word order.

When young Icelandic poets went abroad, they would make their way to some royal court, where they recited a poem of praise before the king, eulogizing his noteworthy deeds, and were rewarded with wealth and honours. But poets would also improvise verses on all kinds of everyday occasions. Battles were a favourite subject, but the poets also sang the praises of fair maidens and the sadness of unrequited love.

In the year 1000 Christianity was adopted by the Althing, the Icelandic Parliament, as the national religion, and with it the literary culture of Europe came to Iceland. But because of the unique political structure of the Icelandic state, literature developed along other lines than it did in Europe. In pagan times secular chieftains had also been the religious heads of the community, and this situation inevitably remained unchanged after the coming of Christianity.

During the first centuries of Christianity the church was therefore subject to the secular power and was not a state within the state as in most other countries. The result was a twofold gain for Icelandic culture: the Church became national in character, and members of the ruling class devoted themselves to book-learning.

Thus in Iceland learned men had both feet firmly planted in the secular world and had a taste for national lore, ancient poems and traditional tales, and consequently the art of writing was taken into the service of the national culture. Icelandic writers, almost without exception, wrote not in Latin but in their native tongue. Religious works were translated into—or composed in—Icelandic, as were works on other branches of foreign learning.

The Icelanders were subject to no earthly king, but after they had become Christians, they began to direct their panegyrics on high, using scaldic metres for sacred poems in praise of the saints of Christianity.

A great many works pertaining to the Age of Learning (1100 - 1200) have been irretrievably lost, but the remaining sources testify to the fact that writers of the time were composing many Icelandic historical and other learned works.

Shortly before the middle of the 12th century an unknown grammarian set out to devise an alphabet for the Icelanders. The work of this grammarian, the so-called *First Grammatical Treatise*, is thus our authority on the first things to be written in Icelandic. This treatise is an outstanding work of linguistic scholarship, an invaluable source of information about the Icelandic language at the time it was being reduced to writing.

The first known records in the Icelandic tongue were the laws of the Commonwealth. These were preserved only in men's memories during the first centuries of its existence, and a special official, the Law Speaker, was charged with the duty of reciting them in public at the Althing. It was thus a great step forward when the code was put in writing about 1100, so that all could know what in fact was the law of the land.

The rudiments of native sagas may already be detected in the works of learning of the 12th century, such as the *Book of the Icelanders* in which Ari the Learned sketches a dramatic picture of the adoption of Christianity at the Althing in the year 1000. (see article page 4).

Ari the Learned also had a hand in making of the *Landnámabók* (The Book of Settlements), in which all the principal settlers of Iceland are enumerated, their original homes and their places of settlement given, and their ancestors and descendants recorded. No other nation in the world possesses such a record of its origin.

With the approach of the Age of Sagas (1200 - 1400), learning no longer

CONTINUED NEXT PAGE

Photos © Arne Mann Nielsen, Copenhagen

Illuminated manuscripts with scenes from everyday life

Before the spread of printing, many illuminated manuscripts were produced in Iceland, especially during the 14th and 15th centuries. There were many scribes, not only in church and monastery but also in the lay world. Calfskin parchment and ink made from plants were in plentiful supply. Some manuscripts were the size of half a calfskin while others were no more than matchbox size. The oldest extant manuscript dates from the beginning of the 12th century when the Latin alphabet was adopted. On these two pages we present details from a 16th century copy of the *Jónsbók*, the law code of king Magnus "the law-mender" (14th century). Opposite, ladies in festive garb attired in embroidered dresses and high headdress. Above, a group of notabilities. Left, saddle horses of the time were richly harnessed. During the long winter nights villagers would gather at the communal bathhouse and one of them would read a book aloud. As manuscripts became worn from constant handling, new copies were made, so few of the earliest remain

Tales of gods and heroes, chivalry and romance

enjoyed the same pre-eminence as before. The *scholarly* writing of history declined as the *artistic* exploitation of history developed.

There can be no doubt that one of the main sources of the sagas are oral accounts of men and events, sometimes from the remote past. The style and diction of the written sagas bear the artistic imprint of oral narrative. Yet the sagas are very far from being a mere copying.

The saga is a prose story whose narrative is swift-moving and concise, free from verbal embellishments and verbosity. The dialogue is terse, and the characters often express themselves in pointed epigrams. The cast of characters is large and varied, and the individual traits of each character are drawn in clear strokes. While minor characters may typify particular human qualities, the main characters are often complicated and even enigmatic. Great emphasis is placed on certain moral commands, ideals, and duties, many of which are of great antiquity.

The highest ideal is *drengskapur*, a term which embraces most of the admired virtues: truthfulness, good faith, sincerity, frankness, humanity, magnanimity, and, above all, the courage to defend honour and family, flinching at neither wounds nor death.

The circle of kinsmen is a powerful defensive bulwark, but the ties of kinship can also become strong fetters to draw men into blood feud and vengeance, in defiance of the precepts equally of pagan law and Christian doctrine.

THE *Kings' Sagas* were the first completely original Icelandic sagas to be written. They derive their name from the fact that the principal characters are kings or earls of northern lands.

Greatest of all the writers of Kings' Sagas was a poet and scholar Snorri Sturluson (1178 - 1241). His monumental *Heimskringla* is a comprehensive history of Norwegian kings from the twilight times of myth down to his own day. Each king is given his own saga in chronological order, but more space than to any of the rest is devoted to the saga of King Olafur Haraldsson the Saint.

In the wake of the *Kings' Sagas* follow other kinds of sagas, each with its own definite characteristics. The *Sagas of Icelanders* are the most original and remarkable and deal with events of the 10th and 11th centuries. They tell mostly of quarrels and conflicts, of killings and blood feuds.

Although the Icelandic Commonwealth was in many ways a well organized state with an extensive system of law, a central authority was totally lacking. As a result, unruly and violent individuals were free to settle their differences by force of arms. Such conflicts would naturally be recognized as fitting themes for a story and be preserved in memory more readily than the peaceful dealings of law-abiding members of the community.

Many of these short stories are miniature masterpieces, such as the story of Audun of the West Fjords, who presented the King of Denmark with the gift of a polar bear and was royally rewarded but in the end reserved his deepest gratitude for the King of Norway, who in time of war had let him pass in peace with a gift intended for the enemy king.

As time goes by, the *Sagas of Icelanders* undergo great changes. The distance between the events and the authors grows and as a result the oral tradition becomes attenuated, and the saga as a literary form begins to lead a life of its own.

New trends from abroad influence development: the French tales of chivalry are translated into the old Norse tongue and leave their mark on Icelandic literature.

The novelty in the *Saga of Laxdaela*, for example, is due to the influence of the translated romances. From them are derived the beauty and "courtesy" of the characters, the splendour and elegance of their dress, and the sentimental quality of their love.

Kjartan Olafsson is "the handsomest man ever born in Iceland", his hair is "fine as silk and hangs down in curls". His wife dies of sorrow when she learns he has been slain.

The current of southern romanticism continues to flow through the *Sagas of Icelanders* side by side with the ancient Icelandic one. Gradually the oral sources from the Heroic Age dry up, but in their place the authors dip deeply into the wells of literature. Fantasy and romanticism flourish and sagas with little or no basis in tradition are written in imitation of older works. This is the literature of decadence of the 14th century.

The decline is partly accounted for by the fact that the Icelanders had lost their independence and become subject to the king of Norway shortly after the middle of the thirteenth century. Finally the creative impulse is exhausted, and saga writing comes to an end around 1400.

ON the watershed between classical saga and extravagant adventure tales stands *Njála*, the greatest and most famous of all sagas, written shortly before 1300.

Its author had at his disposal some historical sources, oral and written, on the persons and events of the saga, but he also helped himself liberally from literature, picking up whatever served his purpose, reshaping it and providing it with a new context to suit his story. His cast of characters is enormous, and the connexion between individual chapters is often of the most tenuous kind.

Gunnar of Hlidarendi is a romantic knight, a splendid figure of chivalry, who can jump his own height in full armour, but his violent temper and his self-will serve to make him human. When he learns that his wife Hallgerdur is guilty of theft, he strikes her in the face. Essentially a man of peace, Gunnar is repeatedly drawn into hostilities and feuds, but the author's sympathies always remain with him.

Hallgerdur, on the other hand, is the character for whom the author seems to have the greatest aversion. When Gunnar is fighting his last battle, she remembers the blow he struck her and refuses to give him a strand of her hair to replace his broken bowstring.

No Icelandic saga has achieved such popularity as *Njála*. It captures a child's imagination with its simplicity and its boldly pencilled outlines, but in later years an adult can return to it again and again and always find new strokes of creative genius, new depths of wisdom. Booklovers in Iceland have long thought it right to read *Njála* once a year. And there are old men who still maintain, maybe with more than a modicum of truth, that in it are to be found answers to all the problems of human life.

The Icelandic sagas and Eddic poems are a notable chapter in the history of world culture, and the manuscripts that preserve them are the most treasured literary heritage of the Icelandic people. ■

Photo Patrick Plumet © Samivel

CHURCH-PEW PORTRAIT

Portrait of an Icelandic farmer and his wife painted by an unknown artist on the pews of a church, probably at the beginning of the 18th century. The woman carries a purse and the household keys at her waist. Her curious headdress is perhaps a development of a much older traditional style (see photo p. 12).

LAND OF ICE AND FIRE

1

'Geysir': the grandfather of all geysers

by
Hjálmar R. Bárdarson

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ON the northern edge of Vatnajökull there is a huge mountain area, Kverkfjöll, cut across by a great chasm with a narrow outlet glacier which separates it into eastern and western parts. Kverkfjöll has 1,800 metre high mountain ridges, and its tallest peak rises to 1,920 metres.

The Kverkfjöll group of mountains is volcanic and doubtless the western Kverkfjöll is still an active volcano. Here is one of the largest thermal areas in Iceland with big steam and hot water springs and boiling mud pots, mainly in or close to a cleft valley called the Hveradalur.

This hot spring valley is in itself one of the most remarkable natural phenomena in Iceland. It is completely covered with hot springs of different types and sizes, steam springs and mud pots, and the slopes on both sides are also boiling to some extent.

At the south-west end of the valley there is a glacier-dammed lake sometimes covered by ice, but also sometimes studded with icebergs that have broken off the glacier above. There seem to be hot water outlets at the bottom of the lake, but hot water also runs from the springs on the slopes. The hot springs even extend southwards and eastwards underneath the glacier ice where high columns of steam ascend through melted holes in the firn (granular ice).

To the east of the lake, there are tuff (porous volcanic stone) hills with countless boiling springs, while at the north-east end of the lake there are some blue boiling mud pots, sulphurous hot springs, most of them seething with a mass of bubbles. From the end of the lake the valley slopes gently up towards a thin ridge across the valley, almost closing it, with small peaks on both sides.

North-east of this ridge the valley is completely different in character, now getting V-shaped and much deeper like a cleft, but opening out further north. The west side of the valley is very steep here, and the colours are extremely rich and varied, even for colourful Iceland. The hot springs are close to each other, covering the whole slope down to the bottom of the valley. The whole area, thick-set with steam jets, seems to be on the boil.

Few places in Iceland convey the feeling of contrast between ice and fire as powerfully as this area, although several others have frost and fire locked in constant combat, and the colours here are beyond description.

There are not many places more remote than Kverkfjöll. From the north one has to travel a long way over lava, sandur-plains and glacial rivers, and from the south the biggest ice cap in the country has to be crossed to reach it. But that is the easiest way if one travels by snowmobile.

Most famous of the Icelandic spouting hot springs is Geysir (in Haukadalur), which has given its name to all similar hot springs in the world. Geysir spouts very seldom now, but nearby there are several boiling hot water springs, some of which erupt regularly such as the one called Strokkur.

The bowl of Geysir is 18 m. wide and 1.3 m. deep, and it is situated in the top of a low mound, built up of layers of siliceous deposits from the spring water. From the bottom of the bowl there is a vertical tube which is about 20 m. deep and 3 m. wide at the top, but it narrows as it goes down. It is believed that Geysir and Strokkur were both formed in a great earthquake in 1294.

We are told in the *Oddaverja Annual* that "...at Haukadalur two big hot water springs came into existence, whereas others which had been there before disappeared." Research based on the time needed to build up the siliceous sinter mound, and dated volcanic ash layers in the soil below it supports this dating.

After 1800 Geysir is often mentioned in foreign books on travel in Iceland, but around 1900 Geysir eruptions decreased in number, and in 1916 they stopped completely. In 1935 the eruptions started again after the

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Photo © Paul Almasy, Paris

HJALMAR R. BARDARSON, *naval architect and engineer, is State Director of Shipping, Reykjavik, Iceland. Designer of the first steel ship built in Iceland, he has represented his country at several international conferences on safety at sea, prevention of oil pollution, etc. Well known for his photographs which have earned him many international prizes, he is also the author of a number of books including "Ice and Fire", published in Reykjavik in 1971 and from which this article is condensed (see Bookshelf page 36).*

Photo James Andanson © Gamma, Paris

BEFORE AND AFTER—Main street of Heimaey, largest of the Westmann islands off the southern coast of Iceland,before and after a violent volcanic eruption on January 23, 1973. A 1.5 km. rift opened up on the edge of the town, red hot pumice rained down and lava invaded the streets, engulfing many of the buildings. The eruption lasted five months. Before the disaster, one-fifth of Iceland's annual catch of fish was landed at Heimaey. (See also photos next page).

Photo © Sigurgier Jonasson, Vestmannaeyjum, Iceland

POMPEI OF THE NORTH. The cemetery of the town of Heimaey as it looked a short time after the volcanic eruption hit it in January 1973. About 250 million cubic metres of lava and ash were ejected on the island. Two months after it began, walls of lava were still advancing in some places at speeds of 50 to 100 metres an hour and in others had reached a height of 30 metres. Bottom left, an Icelandic pony, beloved by all Icelanders, transported to the mainland during the emergency rescue and evacuation operation launched immediately after the eruption. The town is now being rebuilt.

Photo © Stern, Hamburg, Fed. Rep. of Germany

Colour Page opposite:

Like something out of Dante's Inferno, volcanic clouds rise 5 km. above Heimaey engulfed in lava. The smoke was visible from Reykjavik, 120 km. away.

Photo © S Thórarinsson, Reykjavik

Centre Colour pages :

ISLAND BORN IN FIRE. Surtur, the Norse god, is said to have come from the south with fire and thunder. He did so again on November 14, 1963 when the island of Surtsey was formed by a submarine eruption in the coastal waters of southern Iceland. Four months later Surtsey was more than 1 sq. km. in area, but its survival as an island was only ensured the day this photo was taken, on April 4, 1964. On that date sea water no longer found its way to the molten magma in the crater, and flows of lava began to form an island. Today the surface is cold enough for snow to stay on the ground.

Photo © S Thórarinsson, Reykjavik

(Continued from page 16)

water level in the bowl had been lowered, thus reducing the cooling effect of the water surface.

The Geysir eruptions were then and later studied by Dr. Trausti Einarsson, who explains them as follows: "Into the vertical channel of Geysir the water enters at a temperature of 125° C., through smaller passages coming from greater depths.

"At the bottom of the main tube the boiling point is about 132° C. when the water is standing high in the bowl, and therefore the water does not boil at the bottom. At a depth of 10 m. in the pipe the boiling point is about 120° C., and there the temperature sometimes reaches that level and even higher, and boiling of the water there generates an eruption."

It is not sufficient, however, for the water to reach a boiling point to start an eruption. The water has to be overheated by 4 to 5 °C. above the boiling point. The boiling then generates a sudden explosion, and the water above is thrown into the air.

The explosive boiling produces the well known rumbling noise just before the starting of an eruption, which is really the result of a long chain of explosions in the water. In powerful Geysir eruptions the water column can reach a height of 40 to 60 m. and it may continue for about 10 minutes. Towards the end a. steam column emerges from the nearly empty tube.

Strokkur is of a similar type and is situated on the same fissure as Geysir, but it is much smaller.

The highest temperature recorded in Iceland is 280 °C. at a depth of about 1,200 m. in a drill-hole at Námaskard, but the deepest hole drilled so far is in Reykjavik, 2,200 m. deep with a temperature of 146°C.

Photo © Wedigo Ferchland, Horne, Denmark

Colour page opposite :

Top, although virtually devoid of vegetation, the landscape of Landmannalaugar, in the central highlands of southern Iceland is famous for the natural interplay of colours on its craggy slopes. The minerals and chemical composition of the rocks produce a variety of hues ranging from beige and rose to dark green. Bottom, snow-covered Hekla, a 1500-metre high volcano was already famed in medieval Europe as"the gateway to Hell". Situated in Iceland's eastern volcanic belt, it is surrounded by a family of smaller craters. One of these, the Oldugigar crater (foreground) is seen here during its eruption in 1970.

Photo © Solarfilma, Paul Almasy, Paris

2

The glaciers have been retreating for half a century

ICELAND'S glaciers with their snow-white caps against the blue sky have always been acclaimed for their majestic beauty and extolled in many a poem. The Icelandic nation has certainly got to know their many different aspects during eleven centuries of cohabitation.

It even appears that the Icelanders were in fact the first to understand the development and nature of glaciers. If the material written about glaciers in Icelandic had been published in a world language, some of the findings based on the studies of local farmers would have been considered a remarkable contribution to the glaciology of the time.

There is no doubt that some of the settlers from Norway were familiar with the glaciers in their homeland; and in Iceland some made their new homes very close to glaciers. In many places routes between farms ran along the edges of glaciers or even across them.

As is well known, a glacier is a mass of ice, covering mountains or valleys all the year round, the ice being formed naturally from compacted snow. It is evident that a glacier will be formed only if more snow falls during winter than is melted away during the summer.

It has been calculated that glaciers cover 11,800 sq. km., or about 11.5 per cent of the area of Iceland. Icelandic glaciers vary in size from the biggest, the Vatnajökull ice plateau which covers about 8,400 sq. km., to minor glaciers of less than 30 sq. km. in area.

Why do glaciers not grow higher each year since a 4 to 8 metre thick snow layer may be added on to the ice cap in a single year? As Sveinn Pálsson discovered and explained quite correctly in the 18th century, the reason is that although ice is hard and fragile, it has considerable plasticity like pitch.

Glaciers have their discharge like most lakes. Glacier ice is softer than a layer of sea ice, and therefore glacier ice moves slowly under the pressure of its own ice caps from the mountains down valleys where the temperature is higher and melting is more rapid than in the highlands.

Air temperature falls by about 0.5 to 0.7 °C. on the average for every 100 metres we go up in altitude above sea level. Hence, there is often a snowfall in the mountains when it is raining in the lowlands. Each area has an equilibrium at a certain altitude above sea level. Above that altitude snow will accumulate year after year forming a glacier, but below that same altitude the winter snow will melt away during summer.

An ice cap, therefore, does not increase its height if the climate remains constant, even though more snow is accumulated there every year than the warm season can melt away. Further down the ice cap is drained by broad lobe-shaped outlets or by valley glaciers. Here more and more of the ice is melted and at the glacier's front the movement and the melting is balanced.

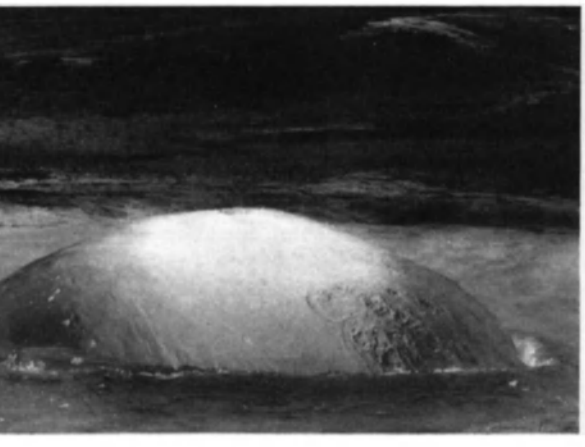
This equilibrium, however, can be disturbed. If some years of unusually heavy snowfall are followed by cold summers, an outlet glacier may advance further down the valley or on to the lowlands before an equilibrium is reached again. Conversely, the snout of a glacier outlet will retreat if several years of relatively light snowfall are followed by warm summers, and that has been the case of Icelandic outlet glaciers during the last few decades.

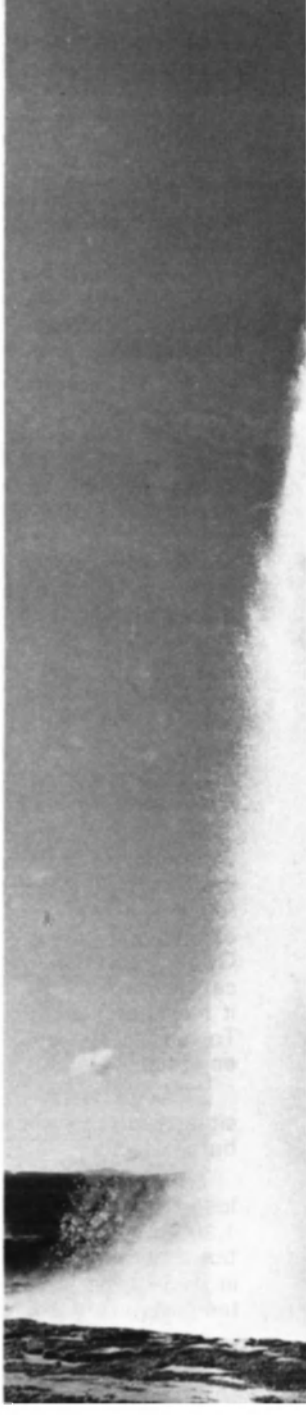
When outlet glaciers retreat, as they have been doing in Iceland for the last 40 to 50 years, they considerably transform the surrounding landscape. Big pieces of ice may remain for some time buried in clay and sand where the glacier has withdrawn, and walking may be difficult in knee-deep mud on the top of a layer of dead ice, preventing the water from getting away.

But vegetation reaches this new area surprisingly quickly, even if there is still ice underneath. In midsummer the vegetation is often so soggy that a man walking in it penetrates to the ice layer. ■

CHEAP CITY HEATING FROM NATURAL HOT SPRINGS

by Sveinn S. Einarsson





Photos J.H. Piepgrass © Wedigo Ferchland, Denmark

THE use of geothermal energy for large-scale heating of houses was pioneered in Iceland, which is natural since it has a climate requiring the heating of houses for 330 to 340 days a year. No fossil fuel sources are available except limited reserves of peat and lignite. But there are a multitude of hot springs and a number of major geothermal steam fields.

The first attempts at heating single farmhouses were made in the beginning of the 20th century. Around 1925 hot spring water was used in the first hothouses for vegetables.

A major step forward was made when the first boreholes for hot water were drilled in the vicinity of Reykjavik, in 1928, yielding 14 litres per second of 87 °C. hot water. A 3 km. long pipeline to the city was constructed, feeding a pilot district heating scheme comprising 70 houses, an enclosed swimming pool, an open-air swimming pool and a school.

This venture was quite successful, and as a consequence more extensive drilling for hot water was started in 1933 at the Reykir thermal spring area some 18 km. outside the city. This yielded about 200 litres per second of 86 °C. hot water, and in the years 1939 to 1943 a new district heating system was constructed, serving 2,300 houses with about 30,000 people and public buildings of the town.

The system included an 18 km. long transmission pipeline, pumping stations, 8,000 cubic metre water storage tanks and an underground distribution network in the streets of the town. This system was commissioned on December 1, 1943 and is still operating quite satisfactorily.

An extension of the system was built in 1949-50. A total of 72 boreholes were drilled producing a total of 330 litres per second of 86 °C. water. The boreholes vary in depth from about 300 m. to 770 m.

The Reykir fields have now been producing continuously for about 35 years, and the total production over this period is of the order of 300 million cubic metres of water without any drop in temperature or decrease of the production rate.

A survey of the area within the limits of the city of Reykjavik delineated a thermal area where deep drilling (700 to 2,200 m.) was started in 1958. The steady yield of this field is now 300 litres per second of 128 °C. water, and more recently another thermal area has been discovered and developed on the eastern periphery of the city.

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Photo © Icelandic Photo and Press Service, Reykjavik

Iceland is endowed with a natural hot water system which provides heating for over 40 per cent of the population. Hot springs abound in this land of volcanoes, the most famous of them being the Geysir which has given its name to similar hot springs throughout the world (see also page 16). Geysir spouts very seldom nowadays but even at rest it gives off a thick cloud of steam (below). The nearby Strokkur (butter-churn) spouts fairly regularly and photos left show three phases, from left to right: the boiling water bubbles up, pressure increases till the bubble bursts, and finally a jet of water and steam is thrown high in the air.

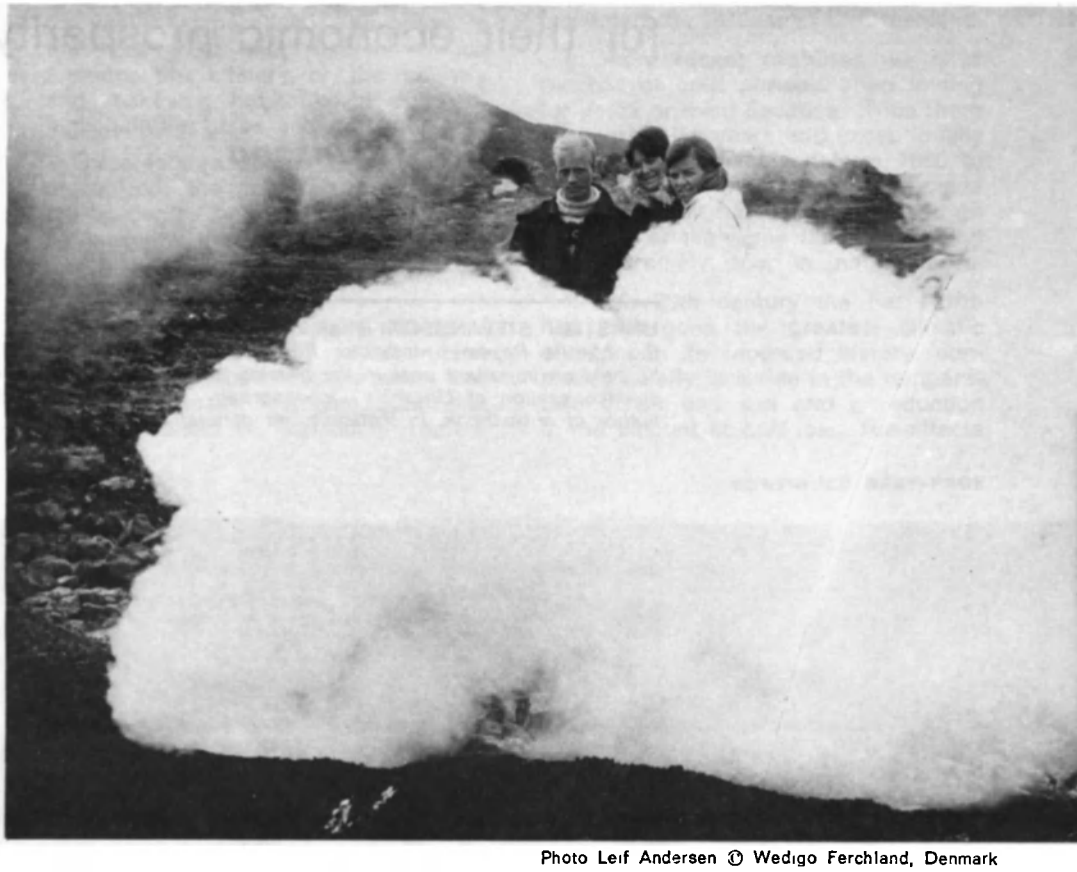

Photo Leif Andersen © Wedigo Ferchland, Denmark

The district heating system has been greatly expanded on the basis of these new thermal sources and 8,700 houses with 72,000 inhabitants were connected to the system by the end of 1969. This represents about 87 per cent of the houses in the city, and the goal of connecting new residential quarters to the heating system as soon as they are built is nearing realization.

The city of Reykjavik has developed, owned and operated the system from the very beginning. It has been highly successful technically and economically and is perhaps more highly regarded by the inhabitants than any other public service. This has contributed to the general concept in Iceland that, where thermal resources are available, a district heating system is a necessary and normal public service, just as much as a cold water supply, an electricity supply or a sewer system.

The town of Olafsfjördur in northern Iceland, with 1,000 inhabitants, built its first district heating system in 1944 using hot water of only 48 °C. produced by drilling in a thermal area about 3 km. away. Deep drilling in 1961 yielded additional water at 56 °C. The system comprises all the houses of the town, and it has been quite successful.

The town of Selfoss (2,200 inhabitants) in southern Iceland has a district heating system which was built in 1948. It heats the whole town comprising 154,000 cubic metres of flats and 75,000 cubic metres of public, commercial or industrial buildings.

The village of Hveragerdi in southern Iceland with 820 inhabitants and therapeutic baths capable of handling 140 patients, is one of the main hothouse centres for growing flowers and vegetables. A district heating system serving all houses in the village and supplying heat to 30,000 square metres of hothouses has been in operation since 1953. This is the only district heating system in Iceland that uses a high temperature field (180 °C.).

Since about 1930 elementary and secondary boarding schools in the rural areas of Iceland have whenever possible been sited at locations where geothermal energy is available. In these centres the school buildings and living quarters for the pupils and staff are geothermally heated. They are also as a rule equipped with a swimming pool, and are self-supplying with vegetables (tomatoes, cucumbers, cauliflowers, etc.) grown in their own hothouses.

There are now many such schools in various parts of the country, and quite often they are used as tourist hotels during the summer holidays.

At the end of 1969 a total of almost 80,000 people, or about 40 per cent of the population of Iceland (204,930), were living in houses heated with geothermal energy. ■

UNESCO ARCHIVES

THE ICELANDERS AND THE SEA

Few nations are so dependent on the bounties of the ocean for their economic prosperity

by Unnstein Stefánsson

UNNSTEIN STEFANSSON *is an oceanographer and chemist at the Marine Research Institute, Reykjavik. From 1970 to 1973 he held an important post in the training and education in marine science section of Unesco's Oceanography division. He is the author of a textbook, in Icelandic, on general oceanography.*

Photo © Paul Almasy, Paris

Fishing is Iceland's principal industry employing one sixth of the nation's labour force and accounting for over 80 per cent of total exports. Right, two fishermen have just landed their catch at a south coast fishing port. Opposite page, fishing in Icelandic waters is difficult and dangerous and calls for the highest standard of seamanship.

EVER since the earliest settlers came from Norway in the late 9th century, the history of Iceland and the life of the Icelandic nation have been closely linked to the sea, to its bounty and to its caprices.

The climate of Iceland is a cold temperate one, but considering the country's geographic position, very mild, especially in winter. The country lies on the boundary between warm and cold currents, both in the air and in the sea.

The chief characteristic of the climate is a sudden alternation between cold winds from the north and warm air currents from the Atlantic. Warm and moist air currents cause thaws in the winter and wet and cool weather in the summer, sometimes for weeks on end. If winds blow from Greenland, the result may be lengthy periods of frost in the winter, especially in the north.

Iceland lies at the confluence of dissimilar ocean currents (warm Atlantic waves carried by a branch of the Gulf Stream and cold water originating in the so-called East Icelandic current) and this, too, greatly affects the climate.

For a succinct characterization of the oceanography of Iceland, one can hardly improve upon the Icelandic poet who described the country as being:

On one side embraced by a warming [flood,
By the sea-ice harshly grasped on the [other.

As a result, there is a considerable difference in the temperature of the sea off different parts of the country. In coastal waters in the north and east the temperature of the sea ranges from 1 to 2° C. during the coldest winter months and from 8 to 9° C. in the summer. Off the south coast it is close to 11° C. in the summer and rarely goes below 6° C. in the winter.

Considering the latitude, these temperatures are very high, especially the winter temperature. The ocean is thus the great heat reservoir which tempers the climate of the country and makes it habitable in spite of high latitude, gales and drift ice.

Three factors determine the climate of Iceland: the country's position on the borderline between warm and cold air currents, the influence of different ocean currents, and the extent of the drift ice.

Due to extensive vertical mixing of sea waters, especially rapid in the boundary zone between the warm and the cold ocean currents, the sea around Iceland is constantly replenished with nutrients creating highly favourable conditions for the vegetation that is the basis of life in the ocean. As a result, biological conditions on the continental shelf off Iceland make it one of the richest spawning and nursery grounds for commercially important species of fish in the whole North Atlantic.

Considerable climatic changes have taken place in the Northern Hemisphere in past centuries. It is believed that in Iceland's early Settlement Age the Far North enjoyed a relatively mild climate, and at that time Iceland had some forests, which have since mostly disappeared. It seems probable that the favourable climate of this period facilitated the settlement of Greenland.

In more recent centuries we have records of cold periods often lasting for years or even decades. Thus there were great ice years and exceptionally cold weather in Iceland from 1686 to 1704. Severe frosts and drift ice made it very difficult for the fishermen to go out, and at the same time the fishing was extremely poor in many places.

In the 20th century the Far North has undergone the greatest climatic changes in its recorded history, consisting chiefly in a rise in the temperature of air and sea and a reduction in the amount of drift ice. The effects

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Photo © Icelandic Photo and Press Service, Reykjavik

Fishing accounts for 80 per cent of exports

of these changes have been very noticeable in Iceland. The rise in temperature was particularly rapid in the 1920s, but the peak seems to have been reached between 1930 and 1940.

These changes in the climate were accompanied by changes in the marine fauna around Iceland, including a wider distribution of more southerly species and an increase in the number of spawning grounds for commercially important species, especially cod.

But during the last decade the climate began to grow colder again: in particular 1968 and 1969 were cold years. This most recent change in the climate has again affected the distribution of fish species around Iceland, especially herring, whose feeding migrations have moved farther east and finally, in the last few years, north to the Spitzbergen region. As a result, no herring has been caught off the north coast of Iceland since 1968.

THE ships of the settlers were too small to carry livestock in large numbers along with people and household goods, and the settlers' herds of sheep and cattle were therefore bound to be very small. So their livelihood at first depended far less on farming than on the hunting and fishing provided by the sea.

The Icelanders soon began to build boats, no doubt using driftwood which presumably was plentiful. In a country practically without forests, the driftwood also came in handy for housing men and beasts and as material for various household articles.

There was also seal hunting and sea-bird catching for the Icelanders to take advantage of, as well as an occasional stranded whale. The sea thus proved to the settlers a generous bringer of varied gifts.

Although the Icelanders have throughout most of their history, in fact up until the end of the 19th century, been regarded as an agricultural nation, marine products have always been the nation's most sought after export goods, besides forming in large measure the basis of the national diet.

For some time after the settlement, the Icelanders had a considerable number of merchant ships of their own in which they went on trading voyages to various foreign lands. In addition to voyages to Greenland and America, we have reports of Icelandic traders in the Baltic, in France, in the British Isles, and, most commonly when they sailed in their own ships, in Norway.

But gradually the seafaring of the Icelanders declined, as the settlement fleet wore out. From 1262 Iceland was under foreign rule, and overseas trade fell into foreign hands to remain there for centuries.

Many reasons have been adduced for this unfortunate development in Icelandic overseas shipping. But the principal one is believed to lie in the Icelandic production and marketing conditions of those times. Icelandic products were lacking in variety, consisting chiefly of homespun and hides, and it is known that during the first centuries after the settlement the demand for these goods fell off, so that the trade was no longer profitable. To this was added the unfavourable location of the country, voyages to Iceland being costly as well as risky for the ships of those days.

Towards the end of the 13th century the export market for Icelandic goods began to improve somewhat. Luckily for the Icelanders a change in European dietary habits resulted in a greatly increased demand for fish. They began to export stockfish, and around the middle of the 14th century dried fish and fish oil were being sold on a large scale in foreign markets. Fish products thus became the principal export commodity of the country and have remained so ever since.

For most of the country's history, fishing in Iceland has been carried on in open boats. In all likelihood very small craft, carrying two or four men, were always most common, so the nation has indeed been fortunate in having rich fishing grounds close inshore. Larger six-oar and eight-oar craft were, however, to be found already during the first centuries of settlement.

In 1770 the Icelanders owned 1,870 boats, of which two-oar and four-oar boats made up about one third each, while just under one third consisted of six-oar and eight-oar craft. In proportion to the population this was quite a respectable fleet, for it would have taken twenty per cent of the nation to man all of it at once.

The first decked fishing boat in Iceland is thought to have been built about the middle of the 17th century, but such vessels are not much heard of until the 19th century. In 1828 their number had reached 16, by 1876 it had risen to 38, and by the close of the century it had passed 100. All of these first decked boats were sailing vessels.

The first motor boat came to Iceland just after the turn of the century and the first trawler in 1905. Trawler fishing, however, did not begin in earnest until a few years later, but it has since played an ever more important role in the Icelandic fishing industry.

At the beginning of 1973 registered open motor boats numbered 1,054, with a total tonnage of 3,313. The 32 trawlers listed in 1973 use trawl fishing as their principal method, but an additional 605 vessels use it to a greater or lesser extent.

In the 20th century the Icelanders finally became a seafaring nation again. At the beginning of 1973 the Icelandic register listed 77 vessels, with a total of 63,633 gross registered tons, for passenger and cargo transport, oil transport, patrolling and fisheries inspection, rescue work, etc. Except for oil, virtually all transport of goods to and from the country is now in Icelandic hands, as well as all domestic transport by sea.

As far as Icelandic marine products are concerned, the most important commercial species have for a long time been cod and herring, but other species of importance include red-fish, haddock, ocean cat-fish, plaice and halibut, Norway lobster, shrimp and scallop.

In the last few years there has been a large catch of capelin most of which has been used for fish-meal. Until about 1910, shark-fishing played a certain role in the fishing industry, and in 1948 whaling was taken up. The record catch of the Icelandic fishing fleet for all types of fish was 1,199,100 tons in 1965, compared to 732,800 tons in 1970.

FOREIGN markets for Icelandic stockfish and fish oil opened up at the beginning of the 14th century, and for a long time these products were the principal export commodities of the country. In the 18th century shortlived attempts were made to utilize natural hot water for salt production. But about the same time the Icelanders began in increasing measure to cure saltfish (principally cod) for export.

After the middle of the 19th century the sale of saltfish increased rapidly, and for a long time saltfish was the chief export of the country. At the same time the production of stockfish

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CLIFF-HANGING EGG-FANCIERS. — Myriads of seabirds of a variety of species nest and lay their eggs on inaccessible ledges on the wild cliff faces of Iceland. At one time some people lived largely upon these eggs, but with the development of fishing and trade they are no longer dependent on this free source of food. Climbing for eggs, however, remains a national sport and Icelanders perform incredible acrobatic feats as they swing vertiginously on long ropes along faces of precipitous cliffs in search of eggs.

Photo © Icelandic Embassy, Paris

decreased, but in recent decades it has again become an important industry, due to the opening of a big market in West Africa.

In 1910 the freezing of fish for export was begun, but the quantity produced remained very small for a long time. In 1950 frozen fish accounted already for about 20 per cent of the total exports and in 1972 chiefly cod-type fish amounted to over 70 per cent of the combined export of frozen and salted fish products: it has thus become one of the most important export products of the country.

With the coming of drift-nets and purse-nets after the turn of the century, herring fishing increased and a new industry may be said to have been added to the Icelandic economy. During the following decades the share of salted herring in the total exports of fish products continued to grow, and in certain years herring has accounted for more than half of the total catch, but there have been considerable periodic fluctuations in the herring catch.

Although Iceland is a barren country, has no forests or mineral resources, and is forced to import not only machinery and other industrial products but also cereals and most necessities of life except fish, meat and dairy products, the Iceland of today is a welfare state. The per capita national product amounted to $2,480 during the period 1966-1970.

The reason for this high standard of living is above all to be found in the rich fishing grounds around the country, and fishing is the industry on which the relative affluence of the country is based. No single nation relies as heavily on the sea for its economic prosperity as do the Icelanders.

In the 1930s the share of fish products in the total value of the national export passed 90 per cent, and at that level it was to remain until the last few years, when the growth of other export industries has brought it down to just over 80 per cent. And as the share of fish products in the exports has increased, the total catch has kept rising, and with it the standard of living of the nation.

Fishing in Icelandic waters is both difficult and dangerous during the long and cold winter months on a rough and stormy ocean. The Icelanders therefore regard it as a vital necessity to use only fishing vessels of the best kind available, equipped with the most modern fishing gear, navigational aids, and safety equipment.

The high total catch per fisherman in Iceland (in 1969 it amounted to about 143 tons per man) is due not only to the richness of the fishing grounds and excellent equipment, but also to the skill of the Icelandic fishermen and their thorough familiarity with local conditions in Icelandic waters.

Iceland has two research institutions working exclusively in the service of the fishing industry: the Fisheries Research Institute and the Marine Research Institute. The Icelanders began systematic fisheries studies shortly after 1930, and activities in this field have expanded and developed to the point where they now include most branches of oceanographic research.

Special emphasis has been placed on studying the physical-chemical conditions and the systems of currents in the sea around Iceland and in adjacent waters. Extensive studies have also been made of the plant and animal plankton and the way it is affected by the chemical and physical factors of the environment.

The principal subject of these researches, however, are the fish stocks themselves, their nature, their size, and the effect that fishing has on them. Recently Icelandic scientists have turned their attention to pollution and its effect on the marine fauna, especially heavy-metal pollution. The protection of the marine environment is a matter of deep concern to the Icelanders.

For several decades Iceland has participated in international research in the field of fisheries and oceanography. Through international organizations, particularly the U.N. Food and Agriculture Organization, Icelandic ichthyologists, fishing captains, and technicians have shared their knowledge and experience with other nations.

The rich fishing grounds around Iceland have long been a favourite haunt of the fishing fleets of various foreign nations. The continuous intensification of the fishing has resulted in a severe reduction of the fish stocks. The death rate of some species has reached dangerous levels. This is particularly true of cod, where the mortality is at least 70 per cent and the proportion of small fish in the catch is rising rapidly.

Thus a point had been reached some time ago where it was clear that the stocks were seriously overfished and the productivity of the seas around Iceland gravely endangered. On September 1, 1972 the Icelandic Government and the Althing (Parliament) decided to extend the Icelandic fisheries jurisdiction to 50 miles. This decision has not been accepted by all nations and has been the cause of some tensions and disputes with certain European fishing nations. ■

Photo © Look Magazine, New York

WHAT'S UP IN HIGHER EDUCATION?

The findings of two Unesco international inquiries

by Victor G. Onushkin and Antony Brock

IN the past decade higher education has changed so dramatically throughout the world that some people are calling for a halt or even demanding that the process go into reverse.

From the outside, the changes are striking enough. Numbers have grown everywhere, both of students and of institutions. Colleges which have been exclusively male for centuries have suddenly admitted women as undergraduates. New kinds of students have enrolled, from social backgrounds which used not to be regarded as producing scholars. New kinds of universities have been created and new methods of teaching employed. In some countries, student demonstrations, not only about political questions but also about the conditions and aims of study, have become almost

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ANTONY BROCK, *British writer and journalist specializing in educational questions, is English language editor in Unesco's Press Division.*

Photo © Pierre Joly - Véra Cardot, Paris

Model of a monumental sculpture for a university by Marino Di Teana, a distinguished Argentinian sculptor.

WHAT'S UP IN HIGHER EDUCATION? *(Continued)*

as regular a feature of university life as examinations.

Internally, higher education systems have had to cope with an explosion of knowledge, for in the last twenty years scientists have found out roughly as much again about the natural world and human nature as the sum of all human knowledge up to 1950.

The scientific and technological revolution has coincided with a period of great social and economic change in all parts of the world, calling into question the accepted aims of higher education. So many problems have arisen that there is even much talk among some people of a "world crisis in education", and the need for guidelines is obvious.

TO help find solutions to some of the problems which higher educational systems are facing, Unesco's International Institute for Educational Planning (IIEP) in Paris undertook a world-wide study on the planning of university development. This involved computer-analyzing replies by 80 universities to a comprehensive questionnaire and carrying out 21 case-studies of university activity, including the teaching process, research work and the formation of teaching teams.

Since the universities participating were located in more than fifty countries, the International Institute had a sufficiently representative group to classify the information and this yielded significant results. Thus the type and level of planning was found to range from comprehensive social and economic planning in socialist countries to indicative type planning in some western European countries, rudimentary planning, or even, in more than a quarter of the universities, no planning at all.

The Institute was able to work out a diagnosis of the present situation of higher education in different parts of the world and in different groups of countries. This showed how rash it is to make assertions about "the world crisis" without differentiating between certain groups.

While there are many new phenomena in university development which are common to many countries, their consequences vary according to the social, political and economic structure of each country. There is a variety of situations ranging from the very critical (including periods of complete disruption of university life as in France and the United States) to the smooth development of higher education in those countries where overall social and economic planning is the rule.

But important general conclusions can be drawn. The first is that in very many universities there is a serious and increasing gap between their activities and the actual needs of their countries for qualified manpower in industry, agriculture or the professions. The exceptions to this are the universities in socialist countries whose functions are programmed in the overall national planning which is part of their system.

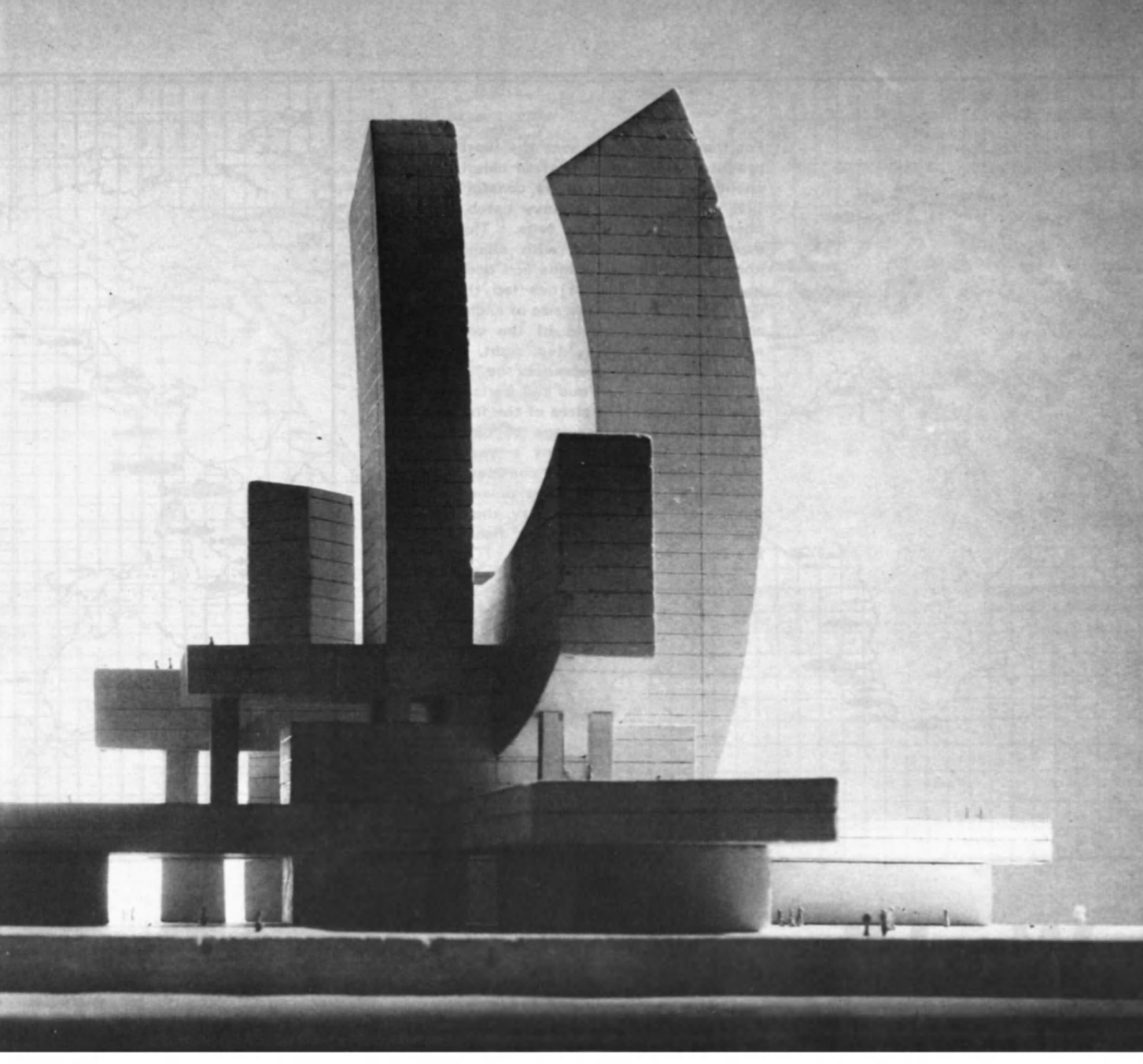
Other universities are badly informed about these needs; very often they have little or no idea how many of their graduates will be required, or in which fields of employment. Of the sample of universities analysed, only 16 per cent said that they were adequately informed about the demand for their graduates. The rest either did not have this information at all or used very unreliable methods to estimate the demand.

The inquiry shows that in terms of both quantity and quality universities do not always relate their programmes directly to national needs. This can produce an unbalanced mixture of graduates, leading to "intellectual unemployment" and a shortage of much-needed specialists. In India and Ceylon, for example, there is a predominance of social science and humanities' graduates over those in engineering. And this imbalance is particularly apparent in some developing countries of Africa where curricula —copied from those of European countries—are not strictly relevant to their own particular situation.

In the last decade universities around the world have had to cope with soaring enrolments, as in Africa where they tripled in the five years up to 1968. Their concern has thus been with questions of quantity: how to expand their facilities, how to increase their budgets and so on.

But quantity is no longer the main problem as the global inquiry of the International Institute revealed. This was confirmed by a special survey carried out by Unesco for the Conference of European Ministers of Education which it organized in Bucharest in December last. In most countries the rate of growth in enrolments is declining and this trend is expected to continue. In the view of university heads, the focus must now be on quality, on defining the aims of higher education, on reforming curricula, on raising the standard of teaching staff and on making better use of existing facilities.

A conclusion of particular importance to international organizations is the fact that despite the rapid growth of higher education in developing countries, the quality gap between their universities and those in industrially developed countries is not diminishing with time, but widening. This is true of both qualified teaching staff and material resources, and as a result, of the quality of teaching and the amount and level of research work.



Some countries in Africa and Latin America face serious difficulties in training highly qualified staff and then in keeping them at the university where they have been trained. Very often conditions are inadequate for research work, and although good training can be had abroad, the chances of putting it to practical use in the students' home countries are sometimes so slim that foreign trained graduates prefer to stay where they can utilize their knowledge and so the "brain drain" increases.

One of the most paradoxical facts to emerge from the study is that many universities which are active on the frontiers of knowledge and research have neither the information nor the administrative means to plan and manage their own affairs. Many university authorities, while insisting on the need for more money, more teaching and research equipment and expanded facilities, are not even aware how existing facilities are being used.

Traditional university structures do not as a rule contribute to interdisciplinary or multidisciplinary studies and research, but tend to separate units instead of creating an atmosphere of co-operation. Their jealously guarded autonomy tends to isolate universities from their social and economic environment and they often remain prisoners of traditions going back to the Middle Ages.

Little information was available on the social and economic backgrounds of students but what there was indicates that despite the rapid growth in numbers, in many countries large sectors of the population, particularly industrial and agricultural workers, are not adequately represented at the universities. This can be traced back to the kinds of primary and secondary education available to different social groups and the fact that certain types of school have very weak links with universities or none at all; some schools are no more than educational "dead ends".

Another important social aspect to emerge from the Unesco study is that although the proportion of women students has been growing rapidly during the last decade women still only add up to an average of just over 30 per cent in the global sample. However, the latest figures for Europe, collected for the Bucharest conference, show women making up 42 per cent of the total of students and in one country, Bulgaria, actually being in the majority at 53.6 per cent.

The study also showed that many countries do not provide proper guidance and counselling for students.

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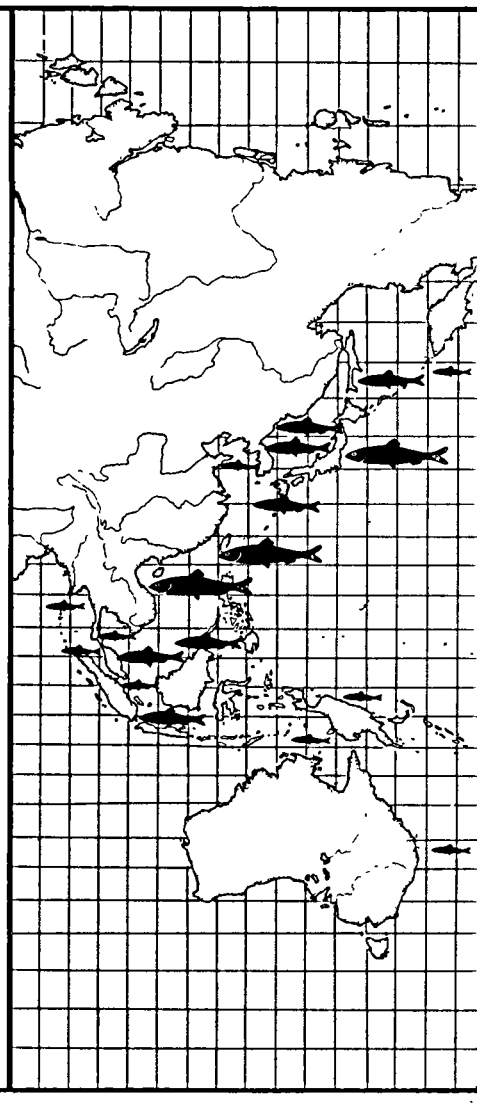
For many years Peru was the world's leading producer of fishmeal, derived chiefly from the anchovies swarming in its coastal waters. In 1968 alone, Peru's anchovy catch totalled a phenomenal 10 million tons. This intensive exploitation combined with changes in the normal behaviour of winds and ocean currents in the eastern Pacific has led the Peruvian Government to limit the size of anchovy catches so as to preserve one of the country's top economic resources. Map, right, is from the *Atlas of the Living Resources of the Sea,* published in 1972 by the U.N. Food and Agriculture Organization (FAO). The sizes of the fish shown on map indicate the tonnage of catches (from 25,000 to 10 million tons a year) made in waters over the world's continental shelves. With its 62 maps, the *Atlas* presents a global picture of the fishing industry, the distribution and movements of different fish stocks and the size of catches.



World's biggest fishery —off Peru— threatened

by Dan Behrman

PERU's 10 million-ton-a-year anchovy fishing industry, for years the world's largest fishery, is today threatened with collapse. Changes in the movements of on ocean current called *El Niño* are partly to blame.

In normal years, the cold Humboldt Current of the eastern Pacific moving north to the equator is driven offshore by trade winds from the south-east.

When it moves away from the coast, deep water wells up to replace it, bringing along nitrates and phosphates to fertilize the growth of plant plankton. The Peruvian anchovies graze on this feast, swarming in such numbers that they have made Peru the world's leading fishing nation.

In abnormal years, the trade winds weaken and warm water penetrates down from the equator. The upwelling stops, so does plant growth. The anchovies fail to appear and the fishermen return with empty holds.

The phenomenon is known as *El Niño* (The Child) because it usually

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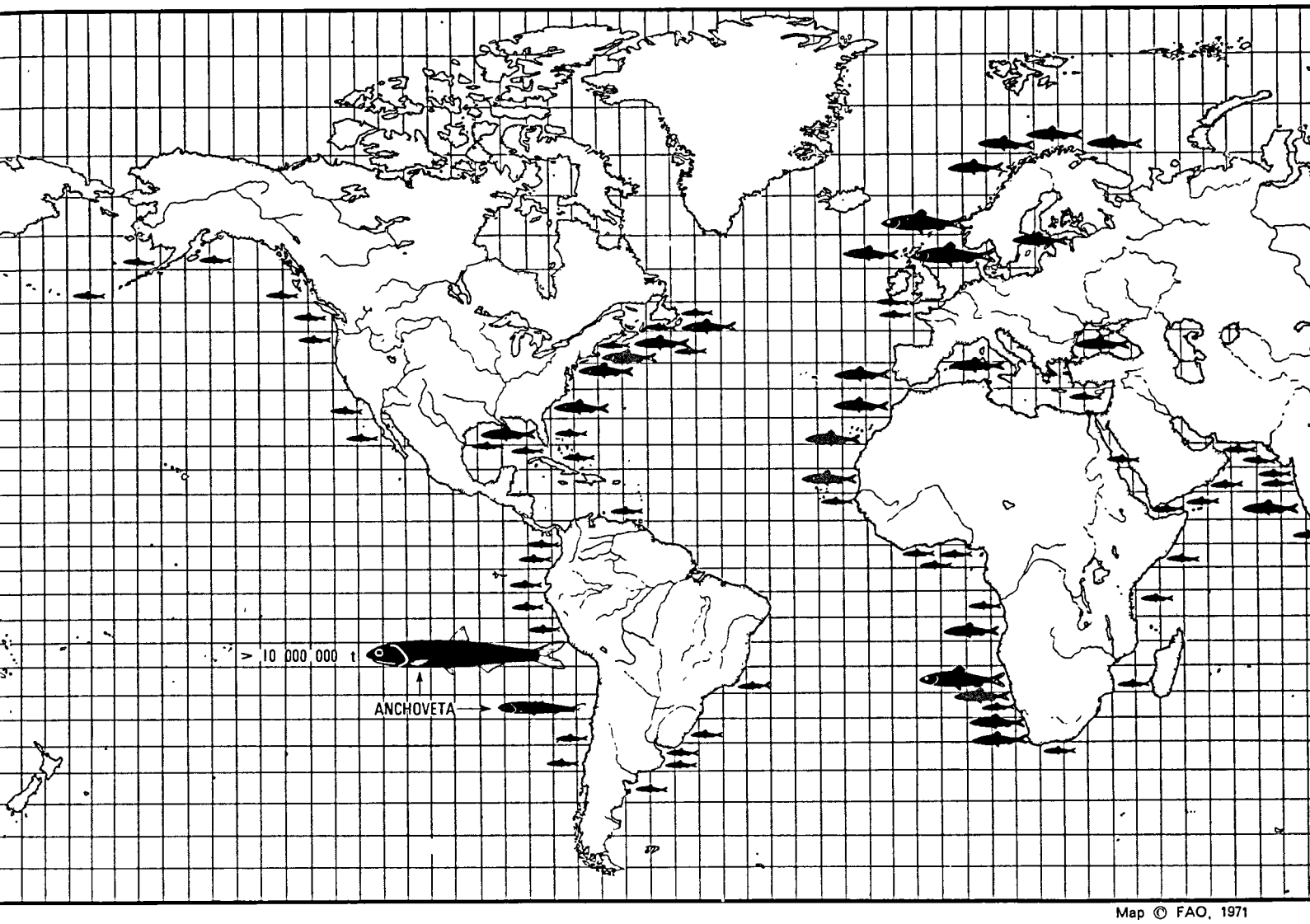

Map © FAO, 1971

occurs around Christmas time, the summer season in the Southern Hemisphere. It struck most recently in 1972 with effects felt around the world.

The Peruvian anchovies are converted into fishmeal for animal feed. Usually, they amount to two-fifths of the world's fish meal production, but the catch in 1972 dropped from 10 million to 4.5 million tons. Demand for protein then drove up the price of soya beans with widespread international economic and political repercussions.

Previously, the anchovies have always returned following an *El Niño*. In 1973, they did not come back in their normal strength and the Peruvian government closed the fishery in April.

No one really knows why the anchovies did not recover. A report by the United Nations Food and Agriculture Organization (FAO) Advisory Committee on Marine Resources Research states cautiously: "Most likely a combination of factors is responsible. The moderately low level of adult stock resulting from heavy fishing can still produce adequate offspring under average or favourable conditions, but a recruitment failure may occur when environmental factors are poor."

The committee is not overly pessimistic: "Fortunately, throughout the period of crisis, the Peruvian government has kept catches at the lowest possible level, thus minimizing the chances of the Peruvian anchovy following the Californian sardine and Atlanto-Scandian (Norwegian) herring into commercial extinction."

Steps that could lead to an international study of *El Niño* were voted by the Intergovernmental Oceanographic Commission at its eighth assembly at Unesco House in Paris, in November last.

The decision to focus scientific effort into a study of the problem was taken by the Intergovernmental Oceanographic Commission when it adopted a resolution submitted by Peru with the support of Chile, Colombia and Ecuador.

The resolution asks the Oceanographic Commission to organize, jointly with FAO and the World Meteorological Organization, a "scientific workshop" on *El Niño*, in a country within the region in 1974. This meeting will have a four fold purpose:

- summarizing what is now known about *El Niño*;
- singling out the main questions that must be answered if it is to be understood and, most important of all, predicted;
- setting up a scientific research and monitoring programme to solve these problems with the "effective participation" of countries belonging to the International Oceanographic Commission and FAO, particularly those affected;
- formulating proposals to study the interaction between *El Niño* and the region's biological resources.

These studies would be made as part of the International Decade of Ocean Exploration now under way. ■

BOOKSHELF

BOOKS ON ICELAND

■ **Icelandic Sagas and Manuscripts**
By Jónas Kristjánsson. Saga Publishing Co., Reykjavik, Iceland, 1970. ($13.80, £5.70)

■ **Iceland**
By Hjálmar R. Bárdarson. Text in Danish, English, French, German, Icelandic and Spanish. Hjálmar Bárdarson, Reykjavik, 1965. 208 pp.

■ **Ice and Fire**
By Hjálmar R. Bárdarson. Translated by Solvi Eysteinsson. Hjálmar Bárdarson, Reykjavik, 1971. 171 pp.

■ **Golden Iceland**
By Samivel. Translated and adapted by Magnus Magnusson. Almenna Bókafélagid, Reykjavik, 1967. 307 pp.

■ **Reykjavik—The Capital of Iceland**
By Bjorn Bjornsson (text) and Leifur Porsteinsson (photos). Translated by Alan Boucher. Heimskringla, Reykjavik, 1969. 134 pp.

■ **Hekla—A Notorious Volcano**
By Sigurdur Thórarinsson. Translated by Jóhann Hannesson and Pétur Karlsson, Almenna Bókafélagid, Reykjavik, 1970. 54 pp.

UNESCO'S TRANSLATIONS SERIES

ICELAND

■ **Hrolf Gautreksson—A Viking Romance**
Translated by Hermann Pálsson and Paul Edwards (New Saga Library). Southside (Publishers) Ltd., Edinburgh, 1972. 148 pp.

■ **Eyr Byggja Saga**
Translated and with an introduction by Hermann Pálsson and Paul Edwards. Southside (Publishers). Ltd., Edinburgh, 1973. 198 pp. (£2.95 clothbound, £1.94 paperback)

INDONESIA

■ **Atheis**
By Achdiat K. Mihardja. Translated by R.J. Maguire. University of Queensland Press, 1972. 108 pp.

IRAN

■ **History of Persia under Qājār Rule**
By Hasan-E Fasai. Translated by Heribert Busse. Columbia University Press, New York and London, 1972. 494 pp.

JAPAN

■ **Homecoming**
By Jiro Osaragi. Translated by Brewster Horwitz. Charles E. Tuttle Company, Rutland, U.S.A. and Tokyo, Japan, 1973. 303 pp. (620 Yen)

■ **Selected Poems of Takagi Kyozo**
Translated and with an introduction by James Kirkup and Michio Nakano. Carcanet Press, Cheadle Hulme, England, 1973. 51 pp. (£1.75)

■ **Izumo Fudoki**
Translated and with an introduction by Michiko Yamaguchi Aoki. Sophia University, Tokyo, 1971. 173 pp. ($7)

UNESCO NEWSROOM

Unesco appeal for Moenjodaro

The Director-General of Unesco, René Maheu, has launched an international appeal for aid totalling $5 million to help save Moenjodaro, the 5,000-year-old city-site of the ancient Indus Valley civilization in Pakistan (see "Unesco Courier", December 1973). Moenjodaro's outstanding archaeological remains are threatened with total destruction unless measures are taken immediately. A plan drawn up by Pakistan in collaboration with Unesco specialists aims to stabilize the right bank of the Indus, lower the water table and conserve Moenjodaro's buildings. The first phase will last five years and cost an estimated $7.5 million.

U. N. University to open in Tokyo

A United Nations University, jointly sponsored by the U.N.and Unesco, is to open this year with headquarters in Tokyo (Japan). A unique innovative experience in the world of learning, it will not be a university in the conventional sense—granting degrees and having a central campus—but a flexible, decentralized network of co-operation and exchange among scholars and among institutions engaged in higher learning and research. It will promote studies on pressing global problems such as international relations and peace, problems of development and the influence of science and technology on the environment and quality of life.

Unesco's international copyright bulletin

Unesco's International Copyright Information Centre in Paris has begun publication of a bulletin designed to keep the publishing and book promotion world abreast of its copyright activities. The Bulletin will be a link for the exchange of information and ideas among specialists, particularly on copyright problems of developing countries. For further information write to ICIC, Unesco, Place de Fontenoy, 75700 Paris.

Guide to 8 audio-visual pacts

The International Film and Television Council, set-up by Unesco in 1958, has just published "The Free Flow of Audio-Visual Materials—a short guide to eight international conventions", by Pierre Chesnais, with an English translation by Gillian Davies. This 68-page bilingual, English-French book can be ordered from International Audio-Visual Technical Centre Foundation, Lamorinièrestraat 236 - 2000 Antwerp, Belgium. Price 320 B. Fr., $8.50.

Getting to know the neighbours

A recent project in international education has pointed the way to better community understanding between Protestant and Catholic schools in Northern Ireland. Contacted by the Protestant Model Girl's School, in Belfast, the neighbouring Catholic Little Flower School for girls agreed to collaborate in an exchange project with a girl's school in Hjardstrup (Denmark). Girls from the Irish schools prepared tape-recordings, scrapbooks and a film with taped commentary on Northern Ireland for the Danish school. Later a joint party from both schools visited Denmark with the help of the Council for Education in World Citizenship and the section of the Danish Ministry of Education which handles Unesco's Associated Schools Project in Denmark. Co-operation between the schools is now as firmly established as the links with their Danish friends.

U.S. ratifies world heritage convention

The United States is the first country to ratify the Unesco convention for the protection of the world's cultural and natural heritage. Under the convention a World Heritage Committee will set up a list of cultural and natural properties considered to be of outstanding universal value. A state may request that a property be placed on a danger list if its conservation requires major operations because of decay, large-scale public or private projects, rapid urban or tourist development, armed conflict or other dangers.

'People'—and family planning

"People", a new quarterly in English, French and Spanish editions, is now being published by the International Planned Parenthood Federation (1). "People" aims "to provide a world digest of developments and debate in the family planning and population field for those who make, influence or carry out policy."

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(1) Annual subscription £2 (UK) and $6 or equivalent in other currencies; from International Planned Parenthood Federation, 18-20 Lower Regent Street, London, SWIY 4PW, U.K.

Flashes...

■ *Nuclear power, which accounted for only 3 % of Europe's electricity generation in 1970, might meet 28 % of the demand by 1985 according to a recent study by the U.N. Economic Commission for Europe.*

■ *The world's airlines carried over 480 million passengers in 1973 and attained a total of 380,000 million miles (10 % more than in 1972) reports the International Civil Aviation Organization.*

■ *The "World List of Universities" for 1973-1974, published by the International Association of Universities, has entries on over 6,000 universities and other higher education institutions in 150 countries.*

■ *The number of tourists travelling in the world (700 million in 1972) is expected to rise to about 3,000 million by the end of the century.*

■ *346 million people living in malarious areas of the world are still not protected against malaria by an organized programme reports the World Health Organization.*

Letters to the Editor

'PORTUGUESE' AFRICA

Sir,

No matter how just and worthy the cause of liberating the African people from Portuguese domination, I maintain that to devote a whole number to this theme is unjustified.

Your aim has always been to provide informative and stimulating reading on cultural and educational subjects and you have usually been successful in what you set out to achieve.

In any case your message in the November 1973 issue lost its impact through repetition.

E. N. Bardon
Booterstown, Ireland

Sir,

I have been a reader and admirer of the "Unesco Courier" since 1960. Reading your November 1973 number I was extremely shocked to find that your excellent magazine had chosen to publish tendentious and biased articles on the position of Portugal in Africa, without giving its many readers the possibility of being able to reach an independent conclusion.

I must say in the strongest terms—and I am sure that my view is that of all Portuguese—how much I disagree with your decision to publish these articles.

"Signed articles", states the 'Unesco Courier' on page 3, "express the opinions of the authors and do not necessarily represent the opinions of Unesco or those of the editors of the 'Unesco Courier'."

How then are we to understand what we read on page 25 of the same issue: "The 'Unesco Courier' offers readers a preview from a special Unesco report on the effects of Portuguese colonialism... in African territories under Portuguese control... This study is one of several which Unesco plans to publish under its programme of 'moral assistance' to African liberation movements."

For these reasons I no longer wish to receive the "Unesco Courier" and am cancelling my subscription.

Adolfo de Castro
Oporto, Portugal

Sir,

Bravo for your November 1973 issue on independence movements in Portuguese Africa.

Jean Lepetit
Marseille, France

Sir,

I do not wish to renew my subscription to the "Unesco Courier" as I consider the November 1973 issue to be tendentious and quite inappropriate in choice of subject, presentation and content.

J. M. Stewart
Paris, France

Sir,

The article by Amilcar Cabral published in your November 1973 issue has real importance. Very few people in the industrially developed countries realize that the cultures of the developing countries are in no way inferior to their own.

What is even more disturbing is that western culture is still used as a means of coercion and exploitation of others.

L. Covez
Paris, France

40 MILLION CHILD WORKERS

Sir,

The October 1973 issue of the Courier gave me quite a pang after I read about 40 million child-workers in the world. Fifty years ago, when Soviet Russia was healing her wounds after the first world war, I was among those who took part in the campaign to help homeless children. Those grim years now belong to the past but I still remember the poor orphans and the effect on them of a life in the streets.

I cannot but feel strong indignation over the position of 40 million children aged from six to fourteen, for it is a disgrace to exploit children's labour. Moreover, this situation exists in some developed countries where there are millions of unemployed adults.

From the pages of your magazine I would like to call on world public opinion to step up the struggle against this gross injustice. Children must go to school.

Can we talk about human rights if merciless exploitation begins with the young ones?

I. I. Marusich
Engineer, Donbass
U.S.S.R.

CHANGING THE WEATHER

Sir,

Your August-September 1973 issue of the "Unesco Courier" on Meteorology was a fine achievement, especially since this science has such an influence on our everyday life.

However, I should like to comment on two of the subjects touched upon. On page 30 you mentioned Professor E.A. Bernard's warning against experiments with artificial rainfall in developing countries. I disagree with this point of view. Not only should these countries undertake such projects which are directly linked with their economies, their development and their independence, but they should also receive the support of the developed countries and international organizations.

The problem is certainly not a simple one, but it does not call for authoritarian solutions based on preconceived ideas decreeing by whom such projects may be undertaken (at least in the fields of science and technology) or what the developing countries may or may not do before the problem has been fully explored, or because it may or may not suit the interests of more developed countries.

I do not question Professor Bernard's good intentions, but his words could lead to confusion since he does not explain, even briefly, the scientific and historical background to the question of weather modification. This would have shown the enormous difficulties scientists have had to overcome to achieve modest but important advances in the problem of artificial rain.

The second subject I would like to raise is that mentioned on page 13—what meteorology can do to help us avoid famine in the year 2000. You do not mention the advantages that could be obtained by experiments with weather modification on a large scale. Among other things, such experiments would enable us to achieve regular crop yields, to extend the land area devoted to agriculture and cattle-raising, etc., with all the social and economic consequences that would imply.

José Miquel Nuñez
The Fight Against Hail Project
Buenos Aires, Argentina

ABC OF METEOROLOGY

Sir,

I am a keen reader of the "Unesco Courier" and I especially enjoyed your issue on the world problems of meteorology and weather forecasting (August-September 1973).

To my mind François Le Lionnais and Roger Clausse found the best way to popularize the subject in "A Short Guide to Weather-Speak" which gives an ABC of meteorology and weather forecasting for the man-in-the-street. I also enjoyed the "50 World Weather Records" which taught me more about various weather phenomena all over the globe.

Although your magazine has on more than one occasion tackled the problems of oceanography, I suggest that it should tell us about the latest aspects of the problem of using the resources and power of the World Ocean.

Anya Lukecha
Student, Lvov University
U.S.S.R.

RIGHTS OF YOUTH IN ARGENTINA

Sir,

I would like to correct some facts concerning Argentina published in your October 1973 issue under the heading "Age Ladder of Rights and Obligations".

Under Argentinian law, the minimum age for marriage is 16 for boys and 14 for girls and not 18 as you stated. As for the age of criminal responsibility, the law contains special provisions for minors. Minors under the age of 16 cannot be subjected to the normal provisions of the penal code; those aged from 16 to 17 can, in certain circumstances, be tried in the same way as adults and even sentenced when, the judge "deems it necessary". Similarly the judge has the power to reduce the proscribed penalty by dealing with an offence as if it were only an attempted offence. Finally, the right to vote is granted at 18 and not at 21.

Dr. Silvano Santander
Examining Magistrate
Parana, Argentina

WHAT'S UP IN HIGHER EDUCATION? *(Continued from page 33)*

As a result, young people often opt for currently "fashionable" courses. The social sciences, for example, are now growing much faster than other disciplines whereas engineering and other subjects which are vital for the economy, are frequently under-producing.

To a great extent the so-called "open system" of admission contributes to these imbalances. Universities such as those in France, where everyone who has a secondary education certificate automatically has the right to entrance, have serious difficulties because they cannot predict the size of student admissions and because the percentage of drop-outs is much higher than in universities where admission is by selective examination or assessment. In any case, the aim of unlimited access to higher education often proves an illusion, since selection does in fact exist in other forms, either at the lower levels of education or in the form of a high rate of drop-out.

ENCOURAGING findings are that teaching staffs have increased rapidly in numbers, and despite the fact that junior staff now make up an even greater proportion of teachers, the level of their qualifications has risen. A far larger ratio of today's teachers possess the highest academic degrees.

University teaching staff certainly need all the advantages of youth and high qualifications. They have to face ever new situations as more and more students from widely varying educational backgrounds enrol, specialization is modified by new knowledge and sources of scientific information continue to multiply. Merely keeping abreast of a subject has become almost a full time job.

All this has changed the role of the teacher. From being mainly a source of information, the teacher must now evolve into an organizer of the teaching-learning process and in this students themselves need to play an active part. A consequence is the need to develop the techniques of teaching in higher education. Some universities (the University of London for example) have started work in this direction and in several countries, the U.S.S.R. actively among them, systematic courses for the improvement of the qualifications of university teaching staff have been organized.

The Unesco-International Institute investigation shows that universities are experimenting with new technical media for the teaching process, but partly because of their relatively high costs and partly because of the traditional approach towards teaching, change here is still far behind the level which one might expect to see. For example, computer-assisted instruction was used by only eleven per cent of universities in the sample, U.S. universities being well ahead of others.

One of the directions in which higher education is likely to develop is obviously towards greater democratization. But as the analysis of students' social backgrounds shows, democratization does not happen merely because greater numbers of students are admitted; both the academic and the material conditions have to be created to allow the access of all social groups and classes to higher education.

In some countries, notably the Soviet Union and Poland, special preparatory courses for working youth have been created in order to compensate for varying levels of secondary education and bring young workers directly to the university. In other countries, continuing education centres are introduced to fill these gaps while in the United Kingdom, the Open University, a combination of broadcast and televised instruction with correspondence courses, has been set up to offer the chance of higher education to anyone with the will and the time for it.

Rules of admission are also being eased. Thus, it was reported that in Finland some institutions are required to accept a fixed percentage of students without matriculation; in Sweden, students with a minimum of two years of secondary education can be admitted after an aptitude test; in Yugoslavia adults may enter if they have worked for four years in an activity connected with their proposed studies. In the Soviet Union, technical studies in a specialized school may be accepted instead of the normal secondary courses.

ANOTHER step in the direction of democratization is the widespread introduction of short courses of up to 24 months which are preliminary to, but independent of, full-length university courses of three or more years. A further contribution is the development of the concept of life-long education and its introduction into the university framework. This, while helping to bring people of all ages and different social origins into the university, can also prepare universities for their new function—coping with "the knowledge explosion" by providing refresher courses where qualifications can be improved and graduates retrained. Such functions will help the present higher educational systems to find closer links with working life.

The results of both Unesco inquiries show that universities need to seek clearer definitions of their aims and objectives and to give their programmes more flexibility to meet the goals. The studies point out that this could be achieved through better planning and the use of modern management techniques.

The Unesco study into European higher education shows that the proportion actually enrolled of the age-group who could be at university (20-24 years old) is already very high: 23 per cent in the U.S.S.R., well over 20 per cent in Sweden and the Netherlands, around 15 per cent in Bulgaria, France, the German Democratic Republic, the Federal Republic of Germany and Yugoslavia, and just over 14 per cent in the U.K.

STUDENT bodies are becoming increasingly international in Europe where higher educational institutions receive over 40 per cent of all the world's students taking courses abroad. Latin Americans, in particular, study in Spain, students from African and Arab States in France, and Asians in Britain, while in the U.S.S.R. and the German Democratic Republic foreign students come from a wide range of countries.

Spain and Switzerland reported a balance between the flow into higher education and foreseeable job opportunities, but other European countries had some "overproduction"—in medicine and dentistry in Ireland and the social sciences in Sweden.

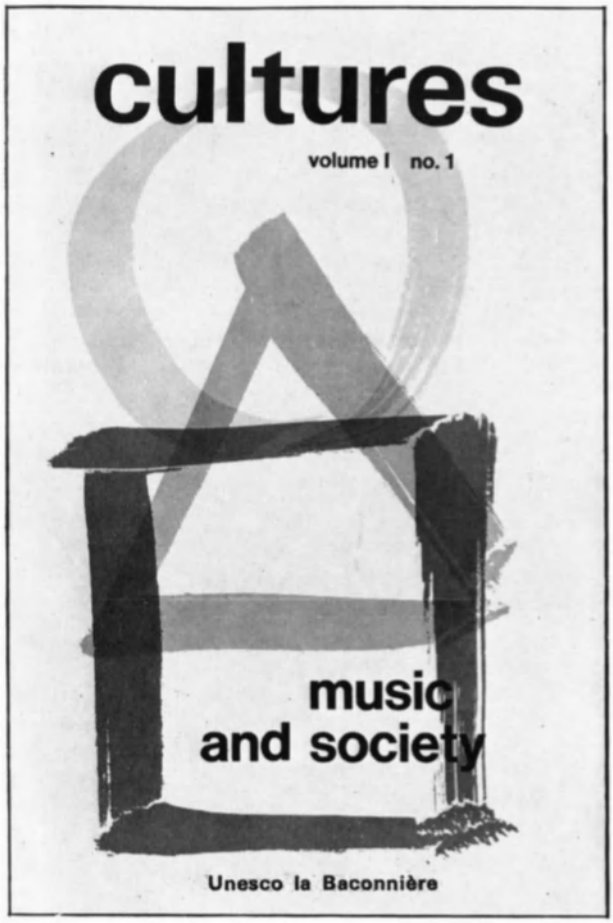
At their Bucharest meeting the European ministers agreed on the need for more plastic surgery for changing the face of higher education. Apart from increasing access to higher education, countries should build bridges between its different forms, doing away with the "class distinction" between university and technical training and making it possible for students to move between them.

They suggested that students at upper secondary school should be prepared both for jobs and for further studies, so that they have a real choice between going to work or going to the university when they leave. They urged universities to admit adults on the same basis as school-leavers and to adapt their organization and methods to accommodate more mature people, who clearly have different experience and family needs from those of the traditional young student.

The ministers also called for greater exchanges of students and professors and asked Unesco to tackle the biggest obstacle to mobility in higher education by speeding preparation of a European convention on the mutual recognition of diplomas. At present, substantial agreement exists only between the socialist countries and inside the Nordic group of countries. ■

Victor G. Onushkin and Antony Brock

Imp. GEORGES LANG, PARIS - Dépôt légal C 1 — Février 1974 — IMPRIME EN FRANCE *(Printed in France)*



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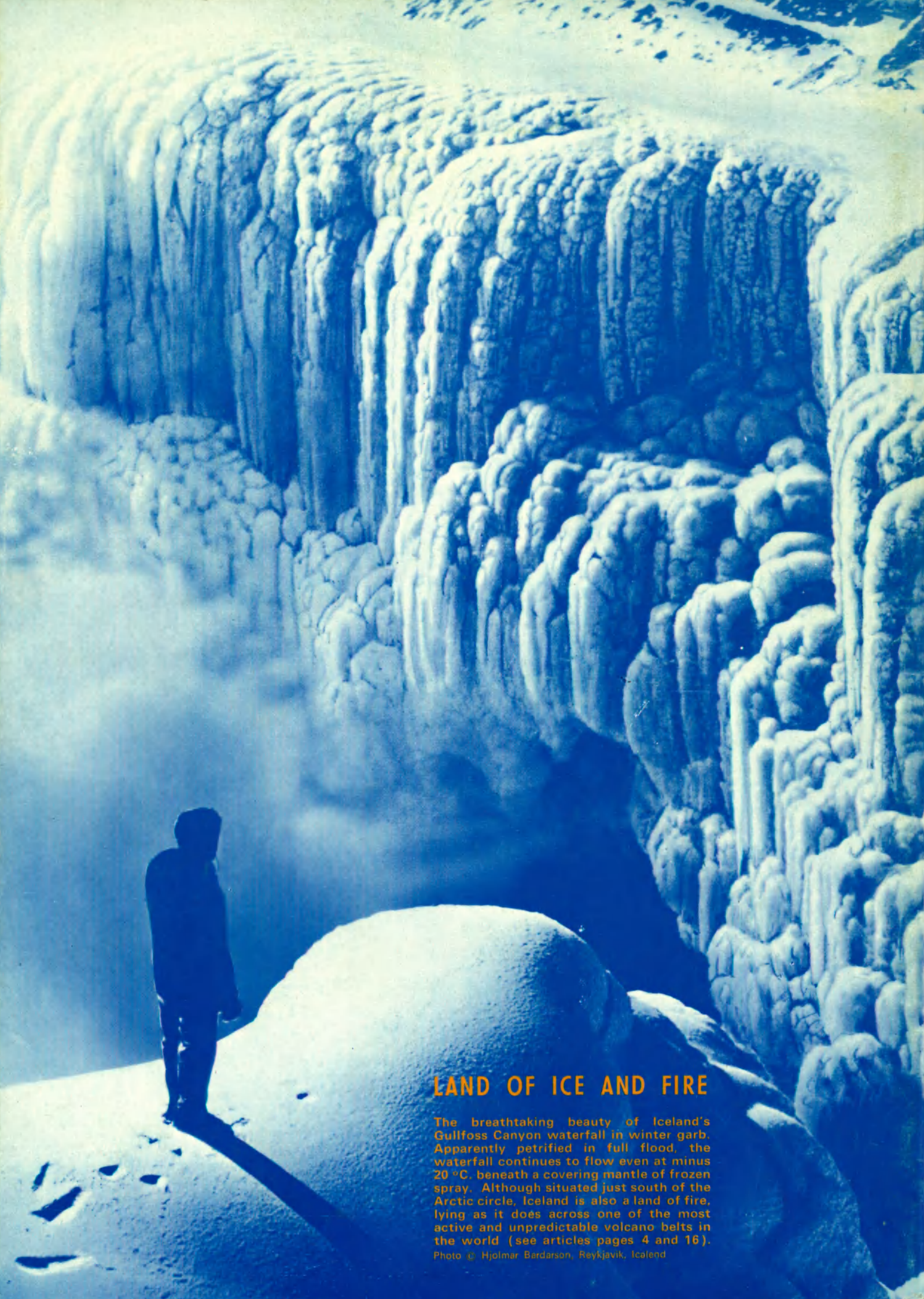

LAND OF ICE AND FIRE

The breathtaking beauty of Iceland's Gullfoss Canyon waterfall in winter garb. Apparently petrified in full flood, the waterfall continues to flow even at minus 20 °C. beneath a covering mantle of frozen spray. Although situated just south of the Arctic circle, Iceland is also a land of fire, lying as it does across one of the most active and unpredictable volcano belts in the world (see articles pages 4 and 16).

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